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# Construction Methods and Equipment

September, 1938

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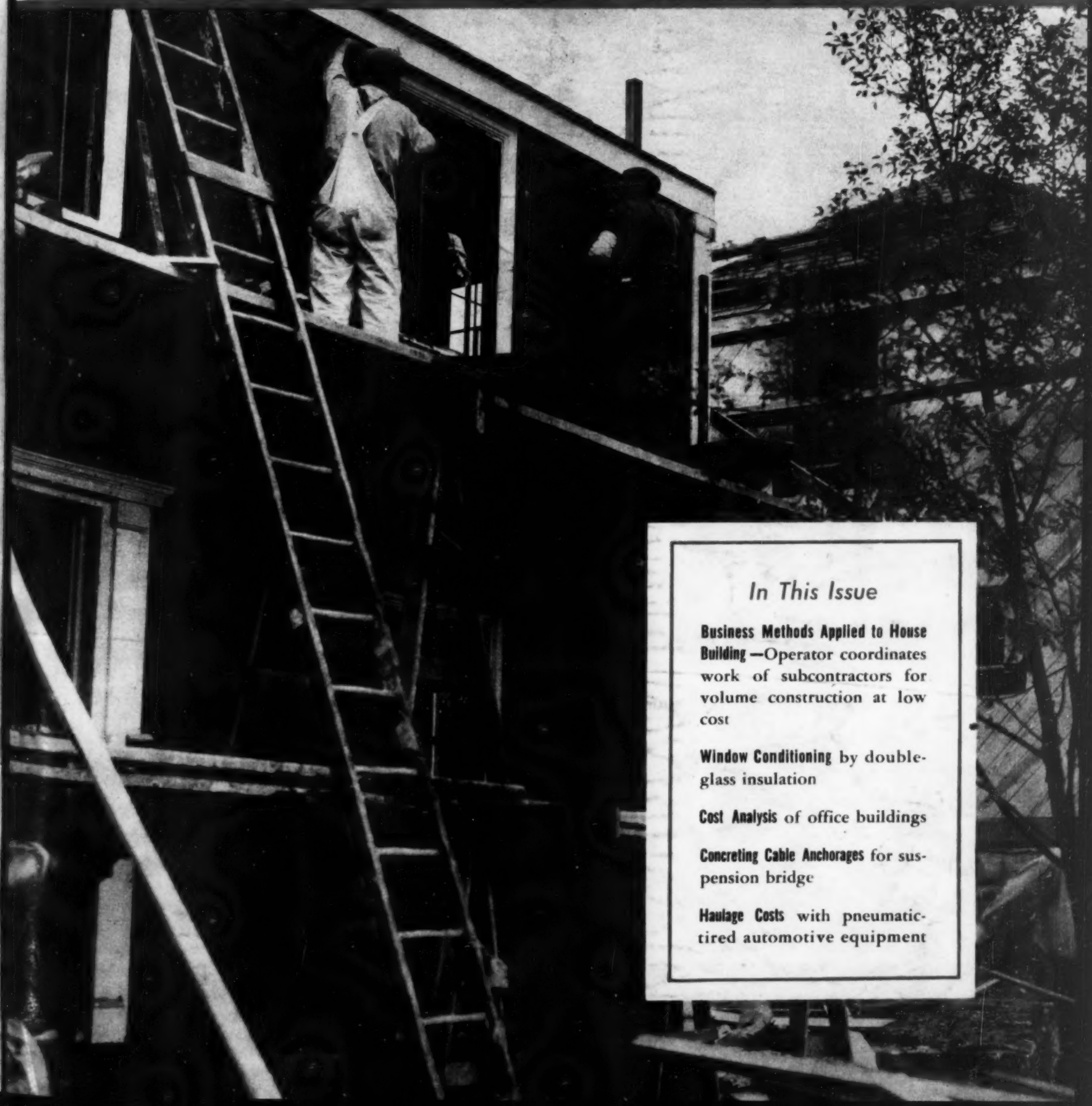


## In This Issue

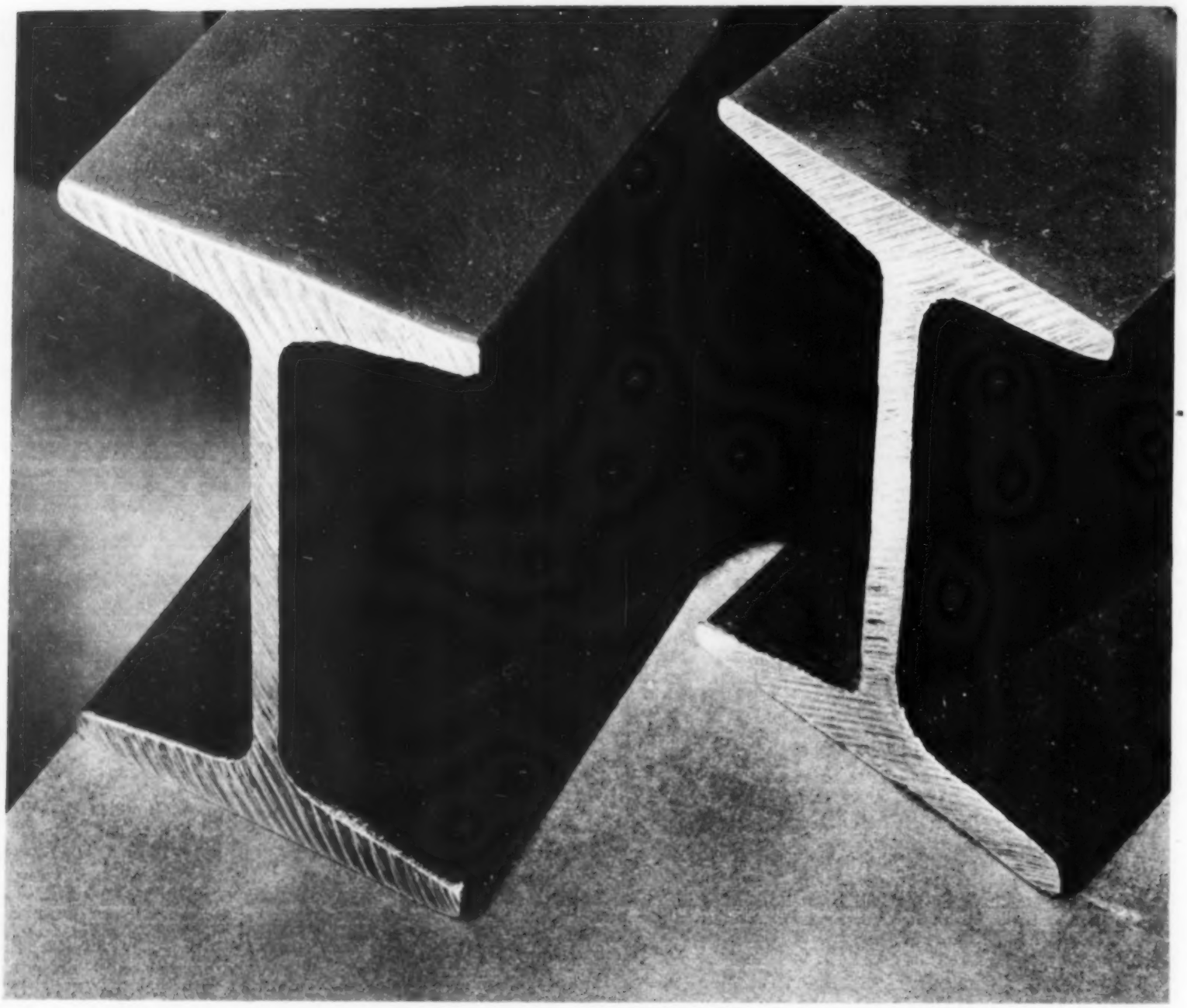
**Business Methods Applied to House Building**—Operator coordinates work of subcontractors for volume construction at low cost

**Window Conditioning** by double-glass insulation

**Cost Analysis** of office buildings

**Concreting Cable Anchorages** for suspension bridge

**Haulage Costs** with pneumatic-tired automotive equipment



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TECHNOLOGY DEPT.

# CURRENT JOBS

## . . . . and Who's Doing Them

## BUILDINGS

**Public** — The Syracuse, N. Y., Housing Authority has awarded the wrecking contract to **General Material & Wrecking Co.**, of Syracuse, in connection with $4,290,000 housing project. At Fairfield state hospital, Newton, Conn., **F. H. McGraw Co.**, of New York City, has $1,446,000 contract for new buildings. Costing $1,060,000, apartment houses at Annapolis, Md., will be built by **John McShain**, of Philadelphia, for the Navy Department. Successful bidder for Marine barracks at Quantico, Va., was **Doyle & Russell**, of Richmond, Va., with price of $1,011,012. Army barracks at Fort Knox, Ky., to cost $1,630,040, are under construction by **Great Lakes Construction Co.**, of Chicago. **Niles E. Yearwood**, of Nashville, Tenn., was low bidder with price of $840,700 for a 7-story state office building. In Dayton, Ohio, **N. P. Severin**, of Chicago, received $838,500 contract for Veterans' Administration building. At cost of $790,000, **A. J. Rife Construction Co.**, of Dallas, Tex., is building Army barracks at Fort Sam Houston, Texas. Auditorium in Little Rock, Ark., is being started by **W. Peterson**, of Little Rock, at cost of $703,900. At Fort Lewis, Wash., **McDonald Building Co.**, of Tacoma, is constructing $610,000 officers quarters. A bid of $620,400 obtained a post-office building contract in Ottawa, Canada, for **A. Janin & Co., Ltd.**, of Montreal, Canada. Substructure contract for Red Hook Housing project in Brooklyn, N. Y., went to **Poirier & McLane**, of New York City, for $669,000. Veterans' building in Battle Creek, Michigan, will be constructed by **J. I. Barnes Construction Co.**, of Logansport, Ind., for $548,680. School administration building in Pittsburgh, Pa., was bid in for $500,694, by **Davis Smith Co.**, of Pittsburgh. In Canton, Ohio, **Gibbons-Grable Co.**, local contractors, secured $659,756 contract for vocational high school.

**Commercial** — Five 12-story apartment buildings, to cost $6,000,000 and to be known as Castle Village, are to be started by **C. V. Paterno**, of Greenwich, Conn., at 181st St. and Northern Ave., New York City. In Oakland, Mo., **H. B. Deal & Co.**, of St. Louis, Mo., have received contract for $5,000,000 apartment house project from Westborough Manor Corp., of St. Louis. For constructing a $4,250,000 residential district compriaing 142 buildings in Los Angeles, Calif., **Lindgren & Swinerton**, of Los Angeles, have received contract from Hostetter Estates. Seventy-five one-family dwellings, to cost $1,250,000 are being built in Lawrence, N. Y., by **Henry Greenberg & B. Goldschmidt**, of New York City. **Sherwood Garden Homes** at Springfield Gardens, Long Island, N. Y., are under construction at cost of $1,077,750, by owner. Ten apartments in Atlantic City, N. J., costing $1,500,000 are being built by **Neptune Housing Corp.**, of **Atlantic City**. For Duke University, in Durham, N. C., **Duke Construction Co.**, of Durham, is building $1,000,000 college dormitories. A $1,000,000 housir. development at Wynnewood, Pa., ha been started by **B. F. Theobald**, of Philadelphia. The **Turner Construction Co.**, of Boston, has a $1,000,000 contract for three college buildings for Boston University, Boston, Mass.

**Industrial** — In Savannah, Ga., National Gypsum Co., has engaged **George A. Fuller Co.**, of New York City, to build $1,000,000 wallboard plant and warehouse. For $650,000, **Borsari Gank Corp.**, of New York City, is building for Anheuser-Busch, in St. Louis, Mo., a brewery stock house. Successful bidder for a $522,000 refinery in Spokane, Wash., was **Winkler Koch Engineering Co.**, of Wichita, Kan. A distillation unit costing $500,000 is being built by **A. O. Smith Corp.**, of Milwaukee, Wis., for Ashland Oil and Refining Co., at Catlettsburg, Ky. In Jacksonville, Fla., Bull Steamship Co. has given $325,000 warehouse contract to **G. D. Auchter Co.**, of Jacksonville.

## DAMS AND WATERWAYS

Low bid for Hansen earth-fill dam in California, was received from **G. F. Atkinson Co.**, of San Francisco, with price of $5,688,420. Kingsley dam in Nebraska, will be built by **Minneapolis Dredging Co.**, of Minneapolis, Minnesota, for $4,948,117. Successful bidder for Whitney Point (N. Y.) dam is **Hunkin-Conkey Construction Co.**, and **Shofner, Gordon and Hinman**, of Cleveland, with price of $2,678,278. For constructing Wappapello dam, in Missouri, low bid of $1,883,469, was received from **Hallett Construction Co.**, of Crosby, Minn. Successful bidder for Roza diversion dam near Yakima, Wash., was **Morrison-Knudsen Construction Co.**, of Boise, Idaho, with price of $526,860. Flood control dam at Cherokee, Okla., will be built by **O'Dell & Riney**, of Kirkwood, Mo., for $515,880.

Low bidder for dredging, pier and quay wall at Portsmouth, Va., was **McLean Contracting Co.**, of Portsmouth, Va., with tender of $1,427,000. Levee contracts in Arkansas were awarded to **C. I. Jones**, of New Orleans, for $225,937, and to **H. B. Blanks & Driver**, of Memphis, Tenn., for $911,241. Dredging in Buffalo harbor, New York, went to **Great Lakes Dredge & Dock Co.**, of Buffalo, for $545,875. Cape Cod canal dredging in Massachusetts, was bid in by **M. A. Breyman & Co.**, of East Boston, Mass., for $353,268.

## HIGHWAYS

Recent highway contracts awarded included the following: **Iowa:** Paving in Sac Co., $113,284, to **Metz Construction Co.**, of Clear Lake, Ia. **Illinois:** 7.4 mi. Henry Co., $270,739, to **Central Engineering Co.**, of Davenport, Ia. **New York:** Paving parkway at Rockaway Beach, $611,565, to **B. Turecamo Contracting Co.**, of Brooklyn; paving Grand Central Parkway extension in Borough of Queens, N. Y., $544,070, to **Tuckahoe Construction Co.**, of Tuckahoe, N. Y.; reinforced concrete paving of 6 mi. in Broome Co., $304,464, to **A. I. Savin Construction Co.**, of East Hartford, Conn. **Texas:** 11.7 mi. in Nacogdoches Co., $275,663, to **Harrison Engineering & Construction Co.**, of Kansas City, Mo. **Arkansas:** 15.7 mi. in White Co., $341,670, to **Walker & Michael**, of Memphis, Tenn. **Utah:** 6.8 mi. Iron Co., $255,467, to **McNut Bros.**, of Eugene, Utah. **Mississippi:** 12.4 mi. Marshall Co., $332,291, to **Carey, Reed Co.**, of Jackson, Miss. **Alabama:** Concrete paving in Jefferson Co., $261,702, to **Dunn Construction Co.**, of Birmingham.


# Construction Methods and Equipment

H. W. CLARKE, Vice-President

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ROBERT K. TUMLIN, Editor — A. E. PAXTON, Manager

*Editorial Staff:* Vincent B. Smith, Paul Wooton (Washington), Nelle Fitzgerald


## The "How" of it

***For the benefit of readers concerned with the practical application of method or equipment the following references are to articles or illustrations in this issue that tell:***


How BUSINESS METHODS were applied to house building operations on large scale. — p. 36

How SUBCONTRACTORS were organized and their work on house construction coordinated. — p. 36

How BRICK VENEER for house walls was laid up with air space between brick and sheathing. — p. 37

How RIGIDITY in house construction was provided by solid herringbone bridging between ceiling joists. — p. 37

How RISERS AND DUCTS of conditioned-air heating system were covered with asbestos paper. — p. 39

How DOUBLE-GLASS INSULATION for house windows cuts cost of fuel for heating. — p. 41

How DEEP PIERS were built through artificial sand islands to carry bridge. — p. 42

How ANCHORAGES for suspension bridge were concreted by truck mixers set up in stationary plant. — p. 44

How CONVEYOR BELT 650 ft. long fed sand and gravel to bins of batching plant. — p. 45

How TRIPOD TOWER carried stiff-leg derrick for handling 4-yd. concrete buckets. — p. 45

How ANCHOR FOR CONCRETE FORMS was provided by threaded rods through cantilever wales. — p. 46

How INCLINED TRUSS from mixer delivered concrete in bucket for bank lining. — p. 50

How SEWER TRENCH SHEETING was accomplished with plywood panels and trench braces. — p. 50

How REPAIRS TO STACK atop building were made by inserting 20-ft. length with special rig. — p. 51

How STEEL TUNNEL FORMS were used to shut off water from diversion tunnel. — p. 51

How COSTS OF OFFICE BUILDINGS vary with height. — p. 52

How MODERN EQUIPMENT built divided-lane highway. — p. 54

How SHELL ROADS were surfaced-treated with bituminous material — p. 55

How HAULAGE CYCLE for automotive units on construction is affected by various factors. — p. 56



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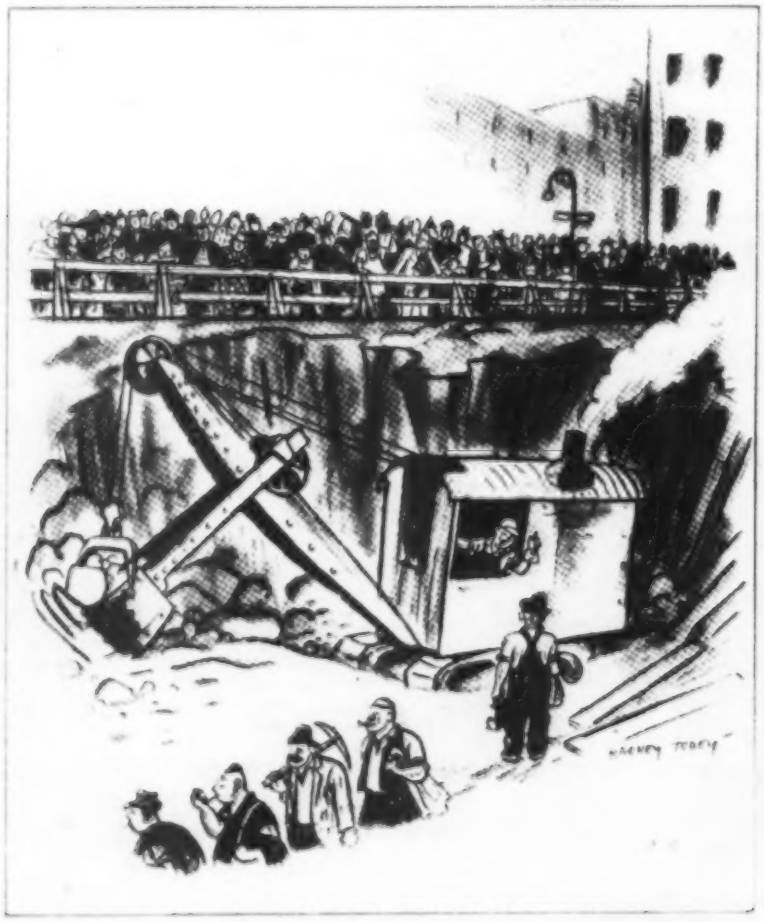
# JOB ODDITIES

A MONTHLY PAGE OF

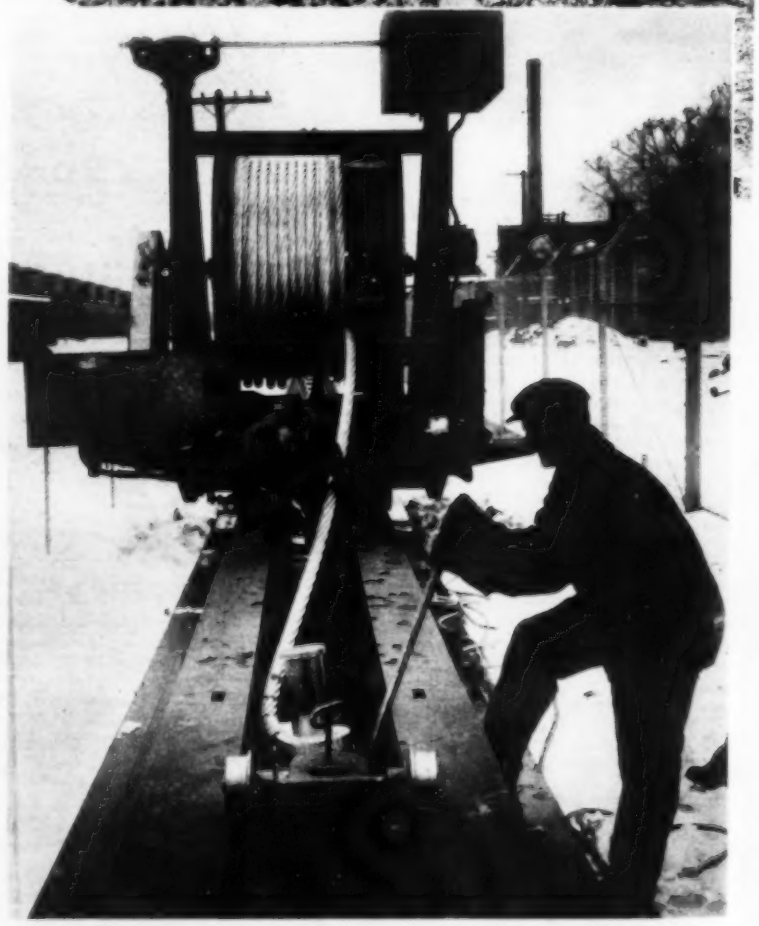
*Unusual Features of Construction*

**SAFETY FIRST** is motto of U. S. Bureau of Reclamation at Grand Coulee dam where riggers are outfitted with buoyant life vests just in case of a tumble into deep water.

**STEEP SLOPES** and heavy loads characterize heavy grading by Granfield, Farrar & Carlin's fleet of Caterpillar diesel tractors and Le Tourneau carryall scrapers on Altamont Pass highway project in California.



*"I know it's quitting time, but I can't disappoint a crowd like that."* — BARNEY TOBEY, IN THE NEW YORKER.



**PRESTRESSING** of cables for suspension bridge over Rio Magdelena, in Colombia, is done at Williamsport plant of Bethlehem Steel Co. to remove excess stretch. Special machine applies load of 183,000 lb. to each of eight cables 2⅝ in. in diameter and 860 ft. long. Cables developed breaking strength of 660,000 lb.

*Good workmanship is important. Care is taken to get a strong, durable bond between old wearing course and new. Edges of chipped-out area are cut clean and vertical to full depth.*

*Carelessly-handled joints break down under use. Years of expense-free service can be added by extra care at these critical points.*

*Photo, above, shows improperly made joint between old floor slab and new section; surface cracks indicate inadequate curing. Right, edges broken down under traffic.*

*Properly made joint shown at right. Careful work, the right kind of concrete, thorough curing—these are the simple essentials. Read details, at right.*

# POINT

## TO REMEMBER ABOUT FLOOR REPAIRS

HEAVY-DUTY floors wear out, have to be replaced. When that time comes, it will pay you to estimate the replacement two ways . . . with Lone Star and 'Incor' 24-Hour Cement.

Both of these time-tested Portland cements produce strong, dense, watertight concrete that stands up under grinding wear and constant exposure to water or aggressive liquids. Which cement to use depends upon job conditions:

If the freshly-placed concrete can be kept wet 7 to 10 days until thoroughly cured, Lone Star will produce the long-wearing, non-dusting floors you need. If the floor can't be kept out of use, 'Incor' 24-Hour Cement—which cures thoroughly in 24 to 48 hours — makes it possible to resurface over a week-end and get the same kind of strong, dense, durable concrete.

That is why we make two Portland cements — to cover the entire range of concreting problems: Lone Star, for the every-day concrete jobs, where high strength, unusual durability and all-around dependability are needed; 'Incor'*, where these qualities plus high early strength and rapid job-curing are required. Write for copy of illustrated book, "Heavy-Duty Floors." Lone Star Cement Corporation, Room 2269, 342 Madison Avenue, New York.

*Reg. U. S. Pat. Off.

# LONE STAR

## CEMENT CORPORATION

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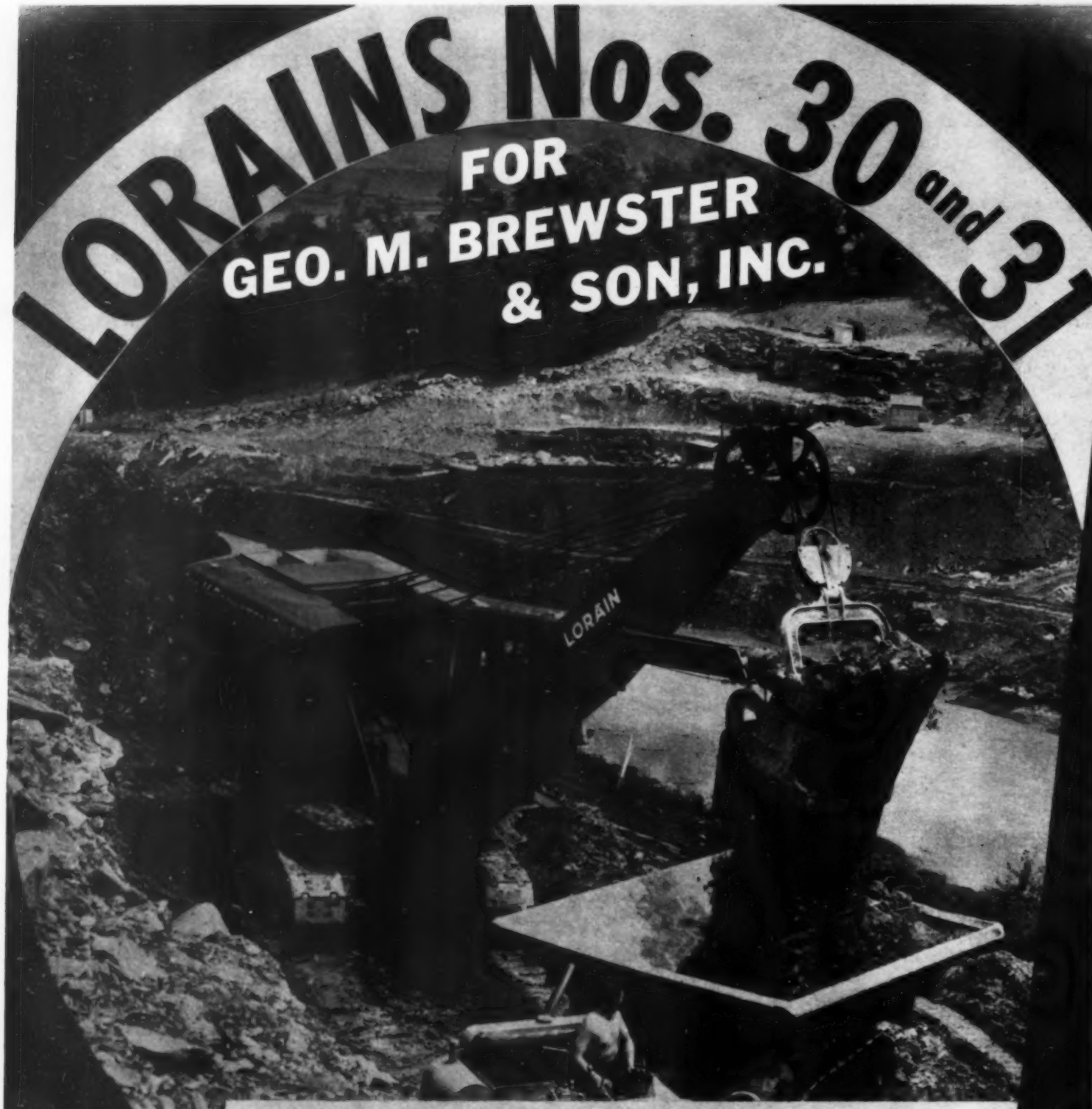
MAKERS OF LONE STAR CEMENT AND 'INCOR' 24-HOUR CEMENT

# LORAINS Nos. 30 and 31

## FOR GEO. M. BREWSTER & SON, INC.




ANOTHER big job for Geo. M. Brewster & Son, Inc., Bogota, N. J.—and their 30th and 31st Lorains go to work . . . It's the Crooked Creek Dam near Ford City, Pa.—a 3,000,000-yd. job with plenty of rock digging.

Many big jobs and millions of yards of excavating have convinced Geo. M. Brewster & Son, Inc., and other fleet owners of shovels and draglines, of the big yardages and profits produced by Lorains. That's why they repeat on them.

For the same reason, one-machine owners also prefer Lorains. What's good for the fleet owner is doubly good for the contractor whose success depends entirely upon the performance of a single unit.

Whatever your needs—play safe and make your selection from the Lorain line of 3/8 to 2½-yd. units. Their Center Drive design is your best assurance of big yardage at low cost.

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THE THEW SHOVEL COMPANY • LORAIN, OHIO

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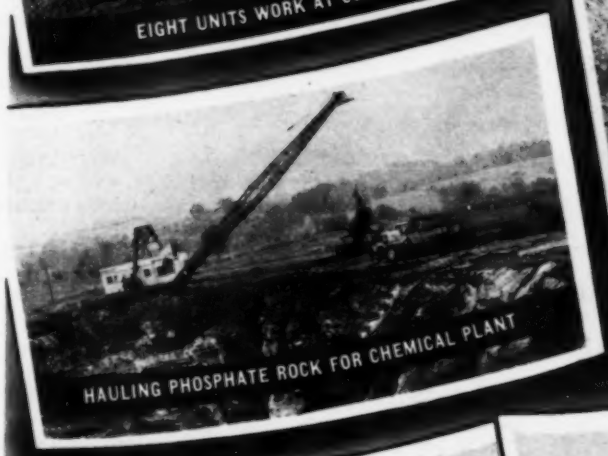
● To the buyer of hauling equipment Trac-Truks offer **two** superior advantages. First, they haul more yardage per hour with an extremely low operating and maintenance cost. Second, they perform more successfully on a wider variety of work. That the Trac-Truk way of hauling is more economical has been proved on scores of "Big Dam Projects" — "Levee Construction" — "Road Work" — "Coal Hauling" and many Industrial Operations. Observe Trac-Truk performance "first hand" . . . a request will bring quick information as to the nearest Trac-Truk job where you can make your own comparison between these units and your present type of equipment. Trac-Truks, by the records they have established, are worthy of your time for such a check-up.

HIGH SPEED TRAVEL AT CONCHAS DAM

EIGHT UNITS WORK AT CONCHAS

HAULS TWENTY TONS UP STIFF GRADES

NINETEEN COAL HAULERS ON MINING OPERATION


HAULING PHOSPHATE ROCK FOR CHEMICAL PLANT

ONE TRAC TRUK SERVES GRAVEL PLANT

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## ALL TYPES OF MOUNTINGS

**Two and four wheel, steel or pneumatic, trucks. Spring-mounted, high-speed trailers, roller bearing wheels and skid mounting.**

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A shining paint job alone does not make an automobile. It's what's under the hood that counts. Now it's the same thing with your pumps. You want a real "he-man" power unit to handle your pumping job. The answer then, is Novo for—

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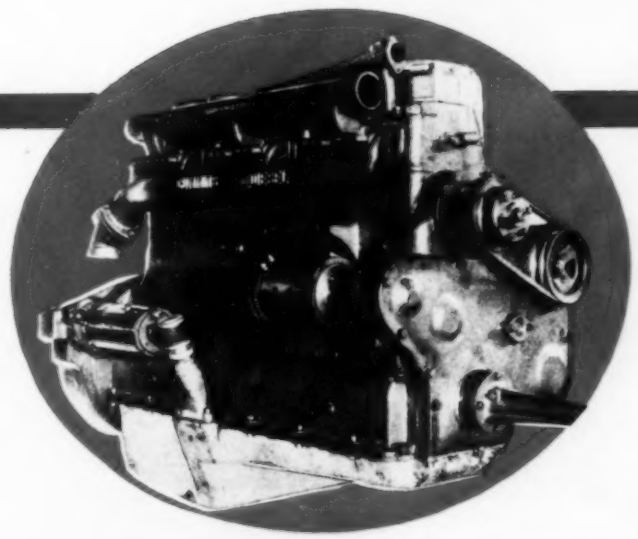
# CUMMINS DIESEL OPERATES

## *100,000 MILES...*

## *"without removing the head"*

*Cummins Diesel powered truck and trailer, operated by the St. Johns River Line Company, Jacksonville, Fla., hauling general freight.*



*Cummins Diesel Engine HB-4 like that installed in above truck-trailer combination. This engine and all other Cummins models can be perfectly lubricated with Texaco Diesel lubricants.*

AND NOT ONLY THIS — when opened up last January 24, this Cummins Diesel was found to be CLEAN, while the greatest wear on cylinder liners was only .006 inch.

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# *Behind the Scenes* at the World's Fair

Combined with feats of architecture, engineering, contracting, transportation are the application of new, modern materials in the quick transformation of the vast fair acreage. One such material is Lehigh Early Strength Cement. It makes concrete that cures and hardens to service strength in a mere fraction of the time required with normal portland cement.

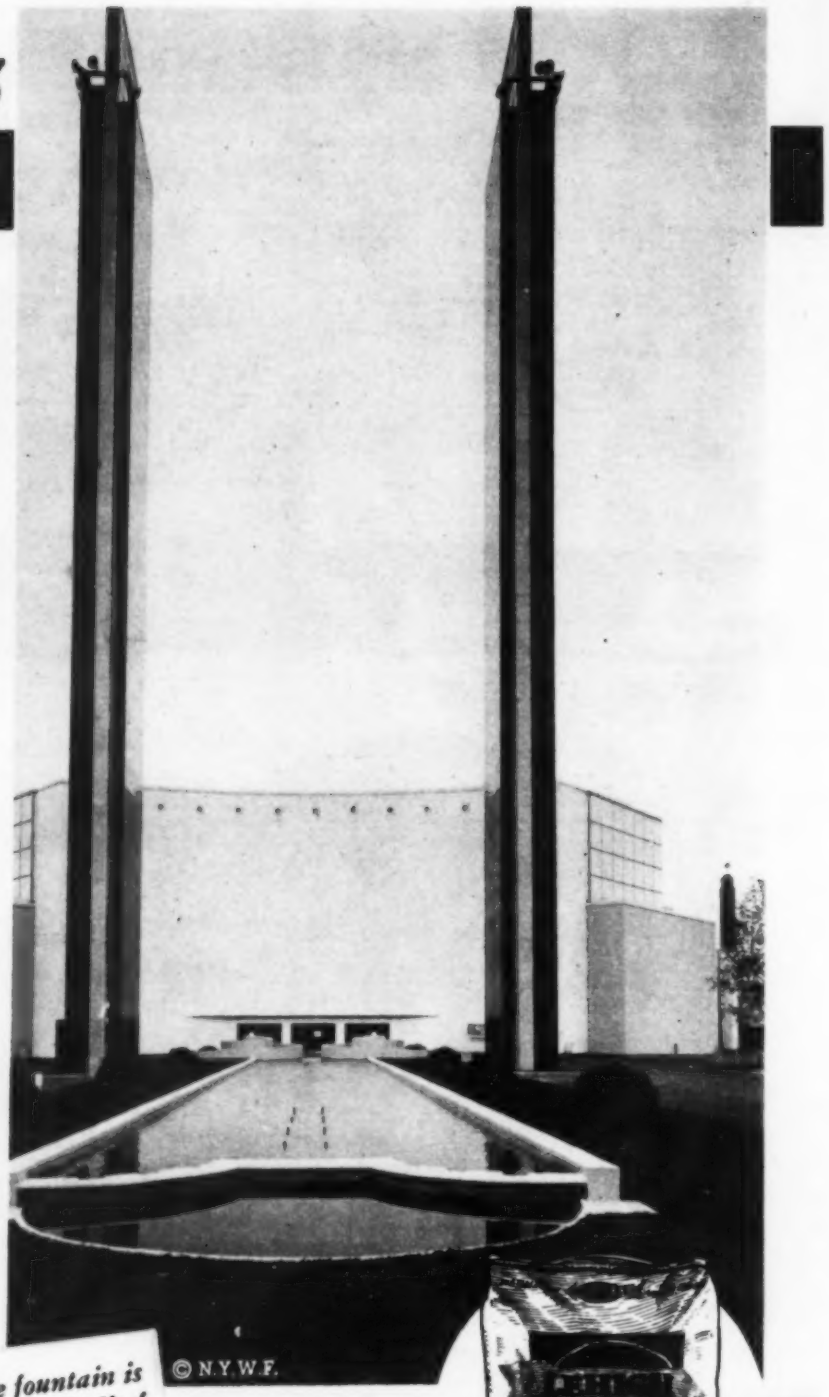
**A typical example of its use was for the fountain in the foreground of the Hall of Communications. A pre-view of the fair was scheduled for Saturday, April 30.**

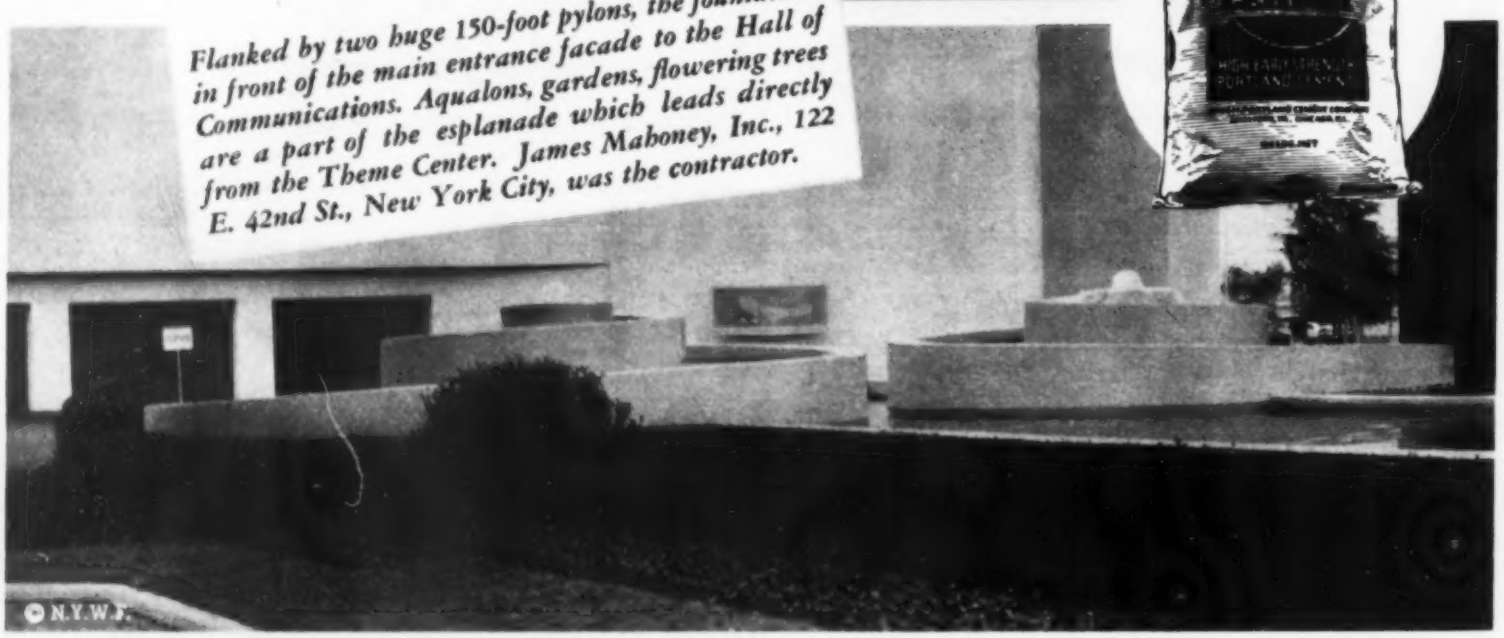
**On Friday the fountain had not been built. Yet by the use of quick service concrete made with Lehigh Early Strength Cement the contractors met the emergency and had the fountain in operation next day in time for the pre-view parade. At midnight, April 29, they started to pour the concrete; finished pouring at 5 A.M.; stripped forms at 8 A.M.; and at noon, April 30, the fountain was in operation. Relatively, this same speed with Lehigh Early Strength Cement can be applied to any concrete construction or repairs.**

Earlier use of concrete means quicker completion and use of the entire work, earlier return on a business investment. Reduced construction costs often result and building in cold weather is facilitated. Ask the Lehigh Service Department about the application of Lehigh Early Strength Cement to any specific construction.

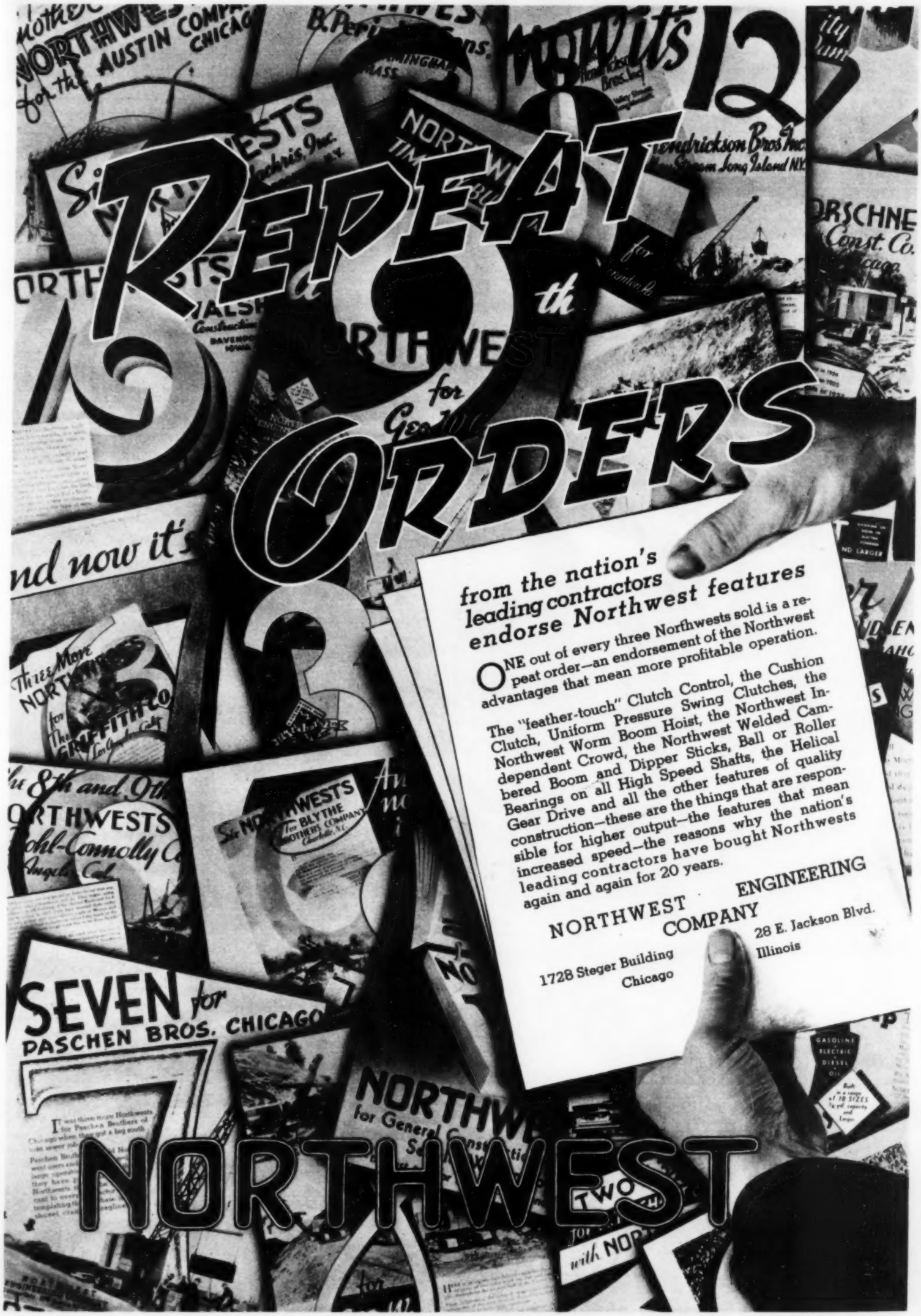
LEHIGH PORTLAND CEMENT COMPANY

Allentown, Pa. Chicago, Ill. Spokane, Wash.




*Flanked by two huge 150-foot pylons, the fountain is in front of the main entrance facade to the Hall of Communications. Aqualons, gardens, flowering trees are a part of the esplanade which leads directly from the Theme Center. James Mahoney, Inc., 122 E. 42nd St., New York City, was the contractor.*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from the nation's leading contractors endorse Northwest features
ONE out of every three Northwests sold is a repeat order—an endorsement of the Northwest advantages that mean more profitable operation.
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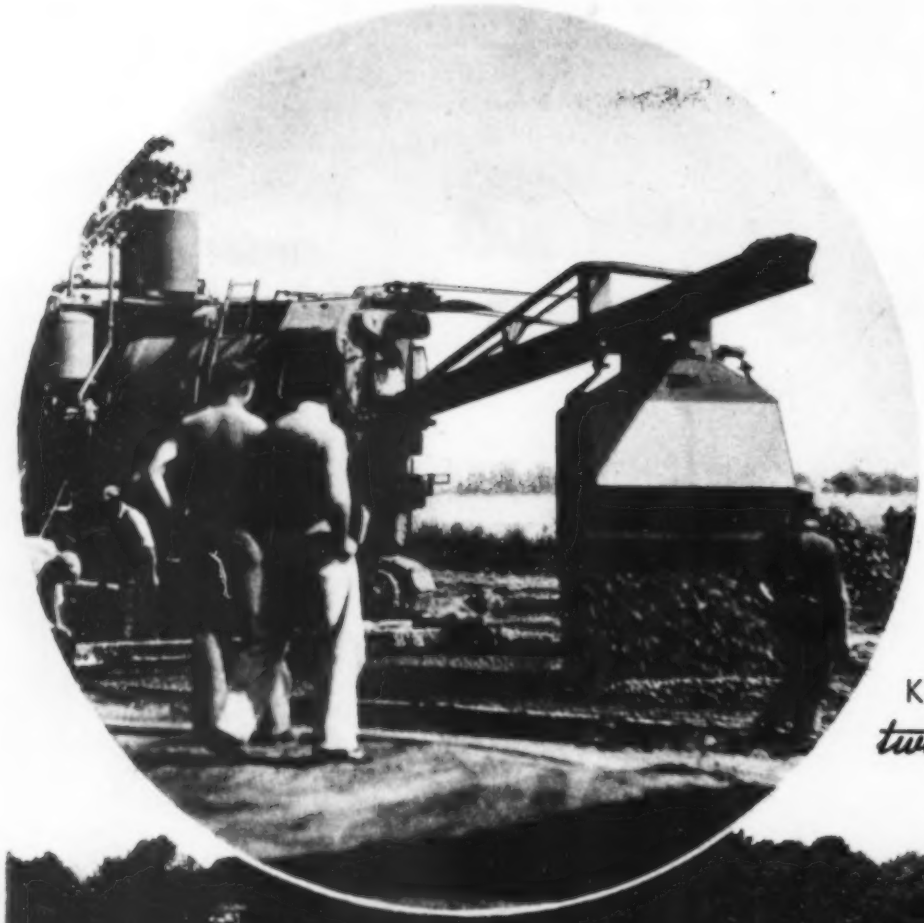
Three More NORTHWESTS
for The GRIFFITH Co.
for The AUSTIN COMPANY CHICAGO
and now it's
12

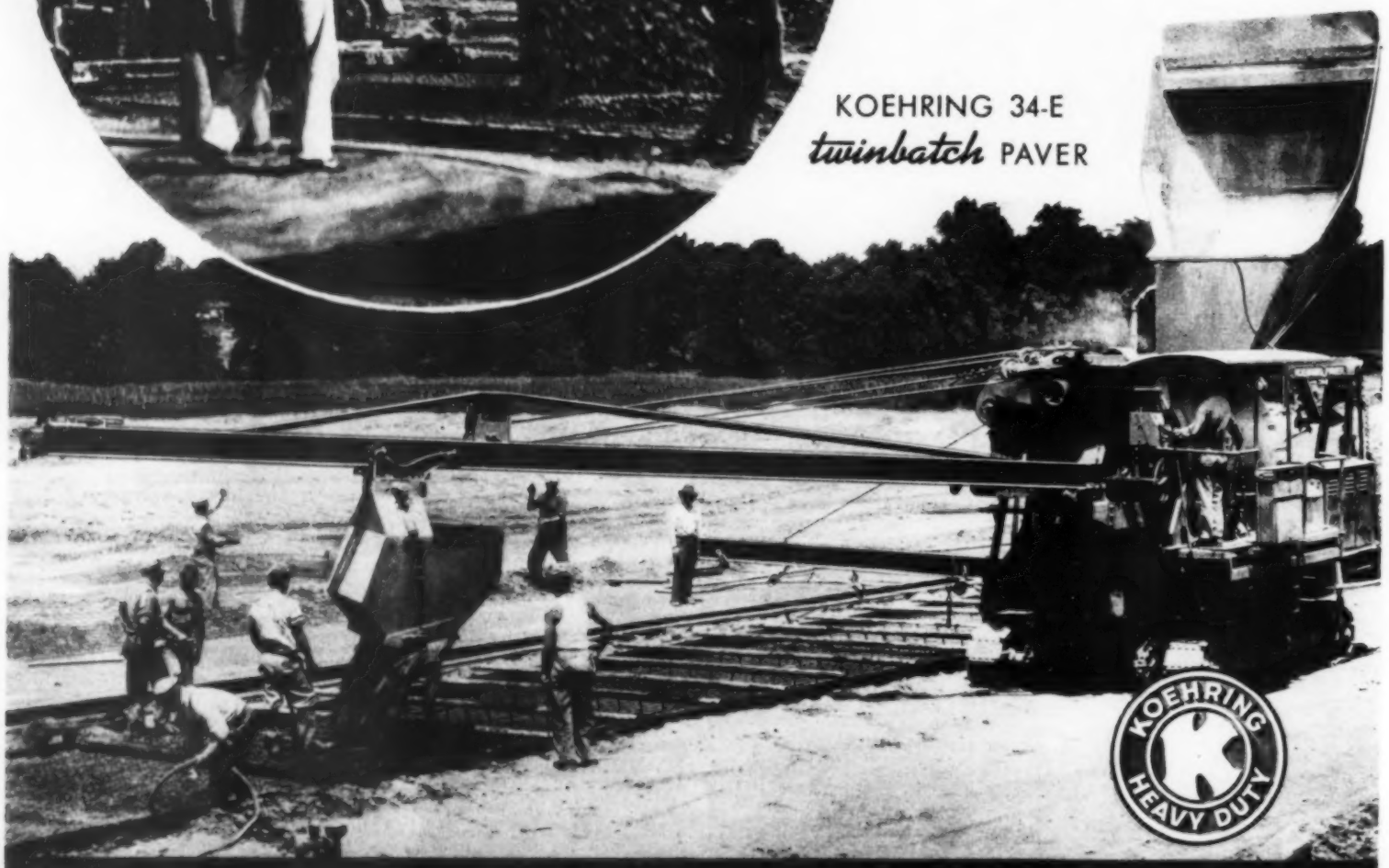
# KOEHRING

## *Maintain Schedules With Profit*



**...greater yardage by more than 75% to 90% has been the experience of many leading contractors *now using* Koehring 34-E *twinbatch* Pavers. Write for names of owners and location of jobs, where yardage results of the 34-E *twinbatch* are establishing new daily records. Paving production schedules are now maintained on a profitable basis with a Koehring 34-E *twinbatch*.**

KOEHRING 34-E
*twinbatch* PAVER

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CONSTRUCTION EQUIPMENT • MILWAUKEE, WISCONSIN

# MAKE US PROVE THIS -- We Guarantee You MORE SERVICE PER DOLLAR Than Any Other Shovel on the Market!

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Heat-treated blade and socket are one piece of steel — without welds — forged with a thicker center and tapered sides, giving a backbone that extends from the cutting edge to the top part of the socket. Puts strength where you need it, saves weight where you don't want it.

Note in cross section above how the thick backbone stiffens and enormously strengthens the frog, where in ordinary shovels 9 out of 10 failures occur. Note in cross section below how the backbone reinforces, adds life at the cutting edge, where *all* shovels eventually wear.




The shovel's socket is formed entirely from the backbone—providing a strong, rigid tube for the strength tested, guaranteed white ash handle. Handle is weather-proofed with brilliant red color—blade is black with gold stripe.

**STANDARD TYPES, ONE PRICE:**
**$1.25 Retail**
***(Slightly Higher in the West)***

**For 50 Years Shovel Makers Have Been Trying to Build a Shovel with a BACK-BONE, at a Practical Price.**

**Here It Is—a Shovel Forged 60% Thicker Up Thru Its Center, from Cutting Edge to Top Part of Socket where the Strength is Needed — then Tapered to the Sides to Equalize the Weight.**

**Heat Treated Blade Integral with Socket— No Welds — the Strongest Light-weight Shovel Ever Made—Yet Just about the Lowest Priced!**

Mail Handy Coupon Below for Test Offer and Name of Nearest Razor-Back Distributor.

**THE UNION FORK & HOE COMPANY**
**COLUMBUS, OHIO**

***Makers of Quality Tools for Over 40 Years***

Gentlemen: Send full details on RAZOR-BACK Shovels with name of nearest distributor and special test offer proving "more service per dollar than any shovel I have ever used."

Name .....

Address .....

By Invitation Member
Emblem of BUSINESS CHARACTER
Rice Leaders of the World Association

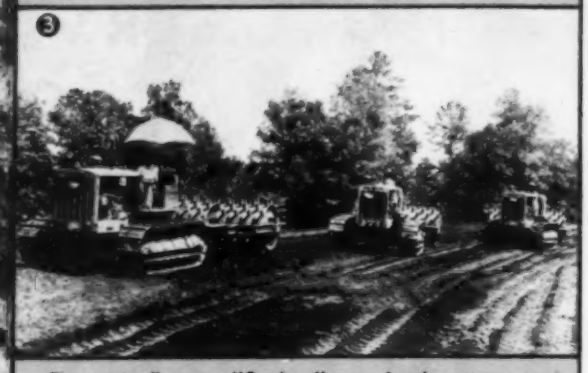
# It's a RAZOR-BACK

(T. M. Reg. U. S. Pat. Off.)

# - the Only Shovel with a BACKBONE

LaPlant-Choate Bulldozers cut earth-moving costs because positive hydraulic control assures absolute down pressure for digging; locking of blade in any position; fast, accurate work under any weather or ground conditions.

LaPlant-Choate Sheep-Foot Tamping Rollers assure efficient uniform tamping. Eliminate waiting for fills to settle . . . give solid compaction of every layer . . . even compaction on rough ground . . . prevent voids and soft spots. Single — double — triple units available.




The famous LaPlant-Choate Rubber Wheeled Wagons are very easy to maneuver, have no inside obstruction to cause dumping resistance, carry exceptionally large loads. Available in 19 yard and 13 yard capacities. Hydraulic control.

The outstanding new "Carrimor" rear dumping scraper reduces loading resistance scientifically, cuts a smooth level grade, loads larger loads with less power and unloads sticky material with ease. Hydraulic control.

Here's the most popular Trailbuilder on the market today. Essential profit-making equipment because it can be used on practically any earth-moving or land-clearing job. Complete hydraulic control throughout.

LaPlant-Choate Treedozers take out scrub and heavy underbrush by the roots. Do a complete land-clearing job in one operation, leaving a smooth, ready-to-work surface. Hydraulic control.

There's a hydraulically-operated LaPlant-Choate snow plow for every snow removal job. Available in either blade or "V" type. Hydraulic power gives you positive digging pressure. . . . A valuable feature when working in hard packed snow or ice.

# You can Plan on Profits

when you use

# LaPLANT-CHOATE Earth-Moving and Land Clearing Equipment

Every LaPlant-Choate unit is scientifically designed to perform its function in the most direct manner possible without unnecessary parts or highly complex mechanisms. Because of this, you can do more work in less time and with greatly reduced service and upkeep costs. Thus you enjoy added profits.

All LaPlant-Choate equipment is hydraulically controlled and designed exclusively for use with "Caterpillar" track-type tractors. You are assured of a properly balanced, smooth, easy-to-operate, perfectly coordinated unit. Get full details today from your LaPlant-Choate and "Caterpillar" dealer. Write today for free literature on the complete LaPlant-Choate line.

LAPLANT-CHOATE MEANS Lower Costs

TRAILBUILDERS
SNOW PLOWS
TAMPING ROLLERS
TREEDOZERS

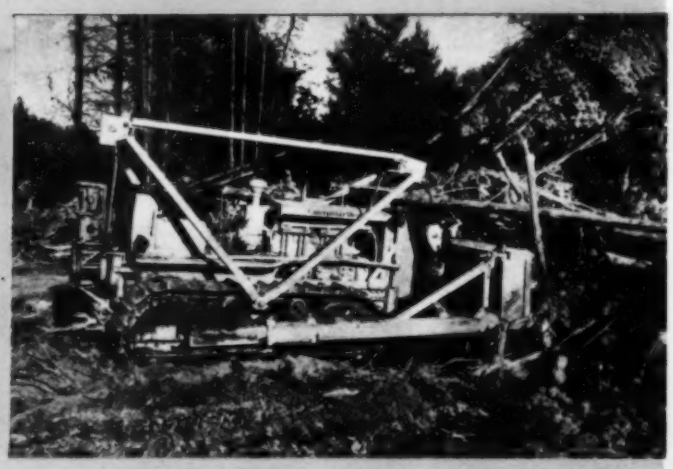
BULLDOZERS
BRUSH CUTTERS
RUBBER WHEEL WAGONS
CARRIMOR SCRAPERS

**LaPLANT-CHOATE MANUFACTURING CO. Inc.**

CEDAR RAPIDS, IOWA.

# Triple-duty POWER

**...FOR PUSHING**



**...FOR PULLING**

**...FOR LIFTING**

POWER AT THE FRONT . . . *double* power at the rear! Here's a "Caterpillar" Diesel D7 Tractor that doesn't seem to get any time off. It was photographed at work, near Granite, Oregon, as it built a pond to float a gold-dredge.

First of all, there were trees and brush to clear. And that's where the front power went to work — driving the bulldozer right to the roots; mowing down everything in its path!

Then the rear power went into action — pulling a carrying-type scraper to excavate on the cleared ground; cutting and hauling heaping loads with speed and efficiency.

But, still, there was work to be done — heavy equipment to unload and spot. And the third photograph in this group shows the second form of power at the rear — the winch operating a crane to take a 7-ton hoist off a truck.

A 16-hour day of work like this. And the "Caterpillar" Diesel used only 3 gallons of 9-cent fuel an hour! Combine economy like that with ability to handle many kinds of jobs . . . plus a minimum of time and cost for repairs . . . and you see why it takes *less* money to *make* money with "Caterpillar" Diesels!

**CATERPILLAR**

TRACTOR CO., PEORIA, ILL.

DIESEL ENGINES

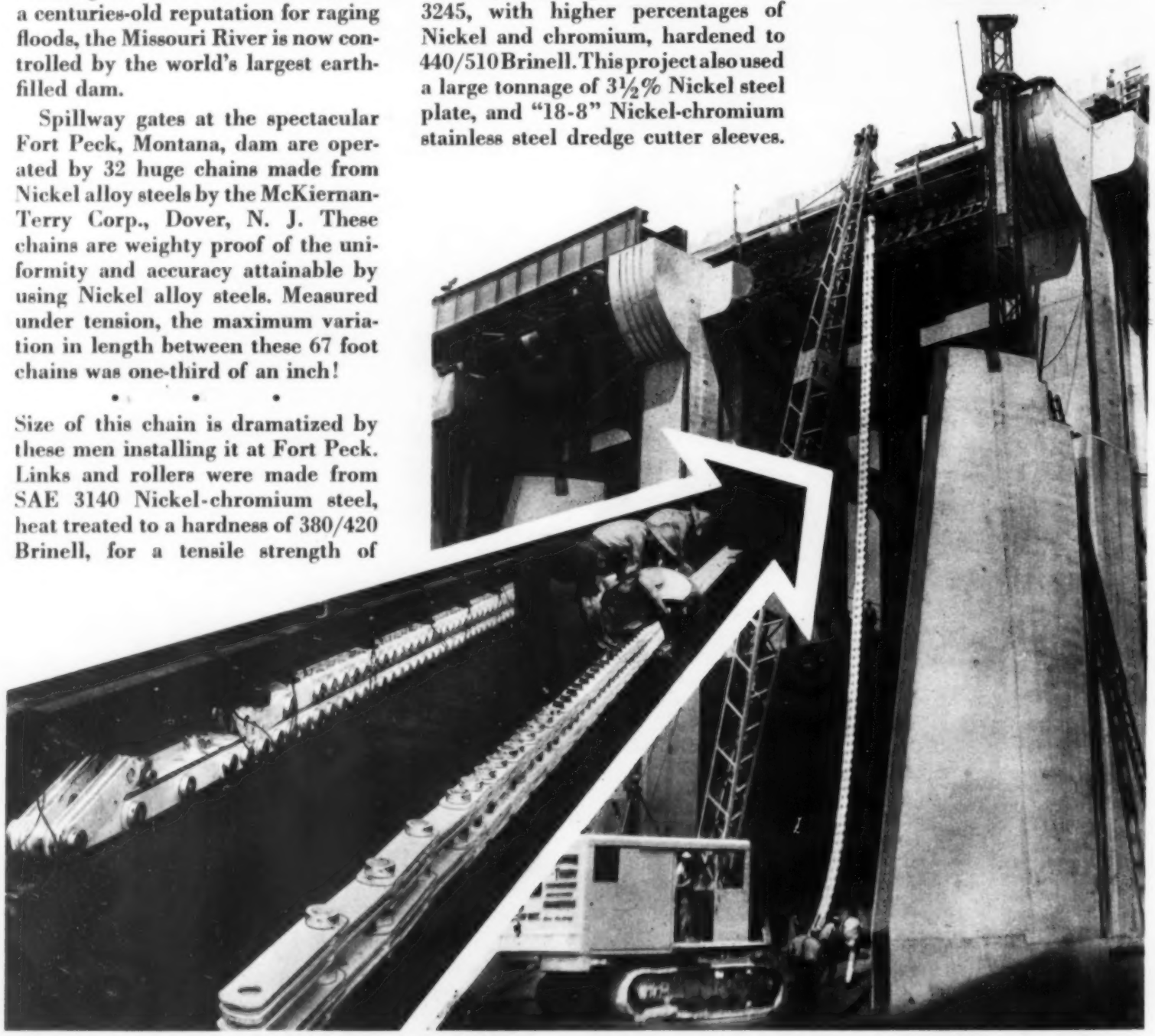
TRACK-TYPE TRACTORS • ROAD MACHINERY

Rushing down from the Rockies, with a centuries-old reputation for raging floods, the Missouri River is now controlled by the world's largest earth-filled dam.

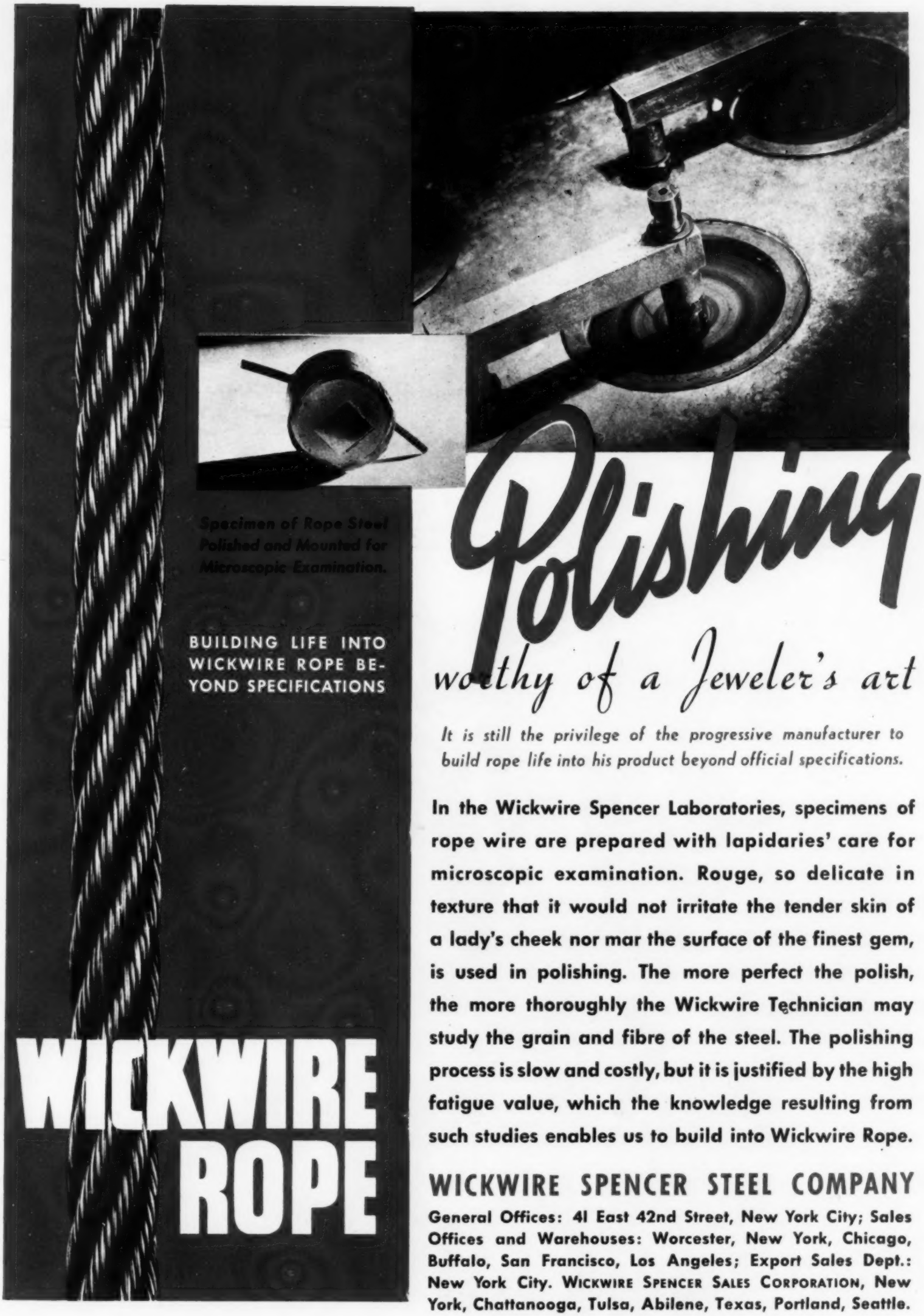
Spillway gates at the spectacular Fort Peck, Montana, dam are operated by 32 huge chains made from Nickel alloy steels by the McKiernan-Terry Corp., Dover, N. J. These chains are weighty proof of the uniformity and accuracy attainable by using Nickel alloy steels. Measured under tension, the maximum variation in length between these 67 foot chains was one-third of an inch!

• • •

Size of this chain is dramatized by these men installing it at Fort Peck. Links and rollers were made from SAE 3140 Nickel-chromium steel, heat treated to a hardness of 380/420 Brinell, for a tensile strength of 180,000/200,000 p.s.i. Pins are SAE 3245, with higher percentages of Nickel and chromium, hardened to 440/510 Brinell. This project also used a large tonnage of 3½% Nickel steel plate, and "18-8" Nickel-chromium stainless steel dredge cutter sleeves.



**THE INTERNATIONAL NICKEL COMPANY, INC., 67 WALL ST., NEW YORK, N. Y.**




*Specimen of Rope Steel Polished and Mounted for Microscopic Examination.*

BUILDING LIFE INTO WICKWIRE ROPE BEYOND SPECIFICATIONS

# Polishing

## worthy of a Jeweler's art

*It is still the privilege of the progressive manufacturer to build rope life into his product beyond official specifications.*

**In the Wickwire Spencer Laboratories, specimens of rope wire are prepared with lapidaries' care for microscopic examination. Rouge, so delicate in texture that it would not irritate the tender skin of a lady's cheek nor mar the surface of the finest gem, is used in polishing. The more perfect the polish, the more thoroughly the Wickwire Technician may study the grain and fibre of the steel. The polishing process is slow and costly, but it is justified by the high fatigue value, which the knowledge resulting from such studies enables us to build into Wickwire Rope.**

## WICKWIRE SPENCER STEEL COMPANY

**General Offices: 41 East 42nd Street, New York City; Sales Offices and Warehouses: Worcester, New York, Chicago, Buffalo, San Francisco, Los Angeles; Export Sales Dept.: New York City. WICKWIRE SPENCER SALES CORPORATION, New York, Chattanooga, Tulsa, Abilene, Texas, Portland, Seattle.**

# FINISHING TOOLS

Are you one of those equipment buyers who believe that LeTourneau Carryalls and 'Dozers are strictly pioneering tools . . . that they are indispensable only where huge yardages of tough materials are to be moved and placed at a profit? If so, we're at fault; we've been all too anxious to tell you how rugged they are . . . that no job is too tough. Even their appearance —with the patented box beam welded construction—casts this illusion.

But, along with all those money-saving features, LeTourneau tools are built for precision. A typical example of Carryall fine grading is the job Pickett & Goodwin's LeTourneau 12-Yard Carryall is doing on their Michigan Highway 46 contract, near Six Lakes (below). After excavating, hauling and placing the bulk of the yardage, the fractional-inch cutting control of the cable-controlled blade trims the slopes, leaves a grade "ready for use," thus, it saves "extra" equipment investment.

Contractor Tom Walsh, of Temple, California, proves the value of his LeTourneau Angledozer as a finishing tool (inset) . . . spreads crushed rock between forms in the shed yards of the new $8,000,000 Los Angeles Union Depot, to table-top smoothness.

These two "puffs" don't make a gale of perfect examples of finishing work reported by LeTourneau users. But, your "Caterpillar" dealer can tell you of many more in your territory . . . name the jobs . . . then, right before your eyes, right on your own job, demonstrate this feature in a convincing manner. Won't you arrange to see him soon?

**LETOURNEAU**

**R. G. LeTOURNEAU, INC.**

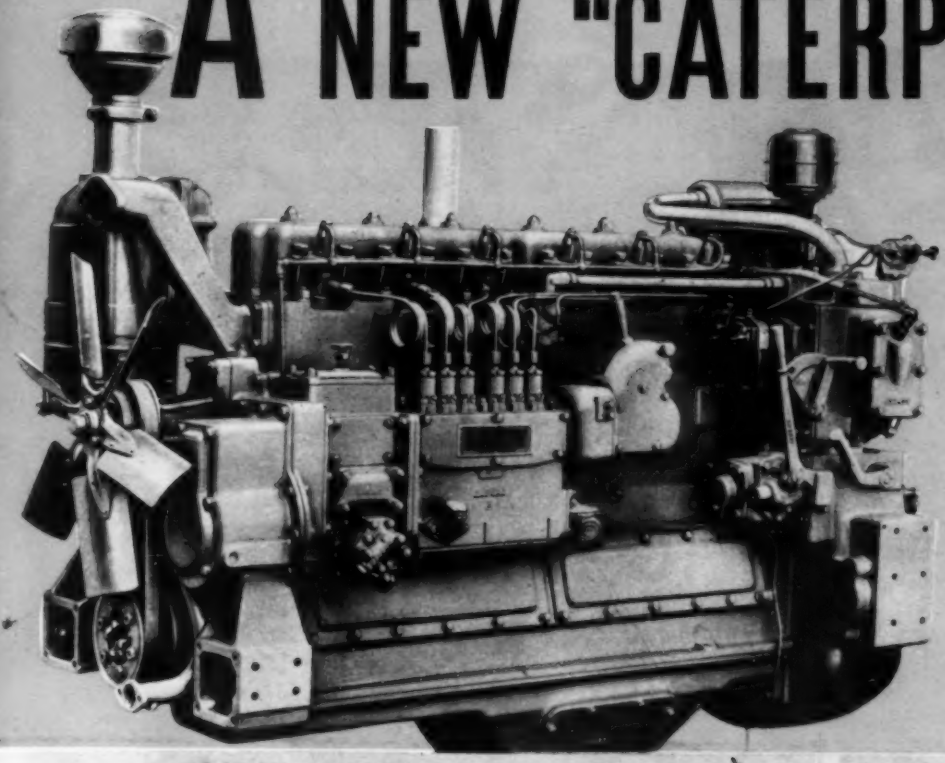
**STOCKTON, CALIFORNIA PEORIA, ILLINOIS**

Manufacturers of: Angledozers*, Buggies*, Bulldozers, Carryall* Scrapers, Cranes, Drag Scrapers, Power Control Units, Rooters*, Treedozers.

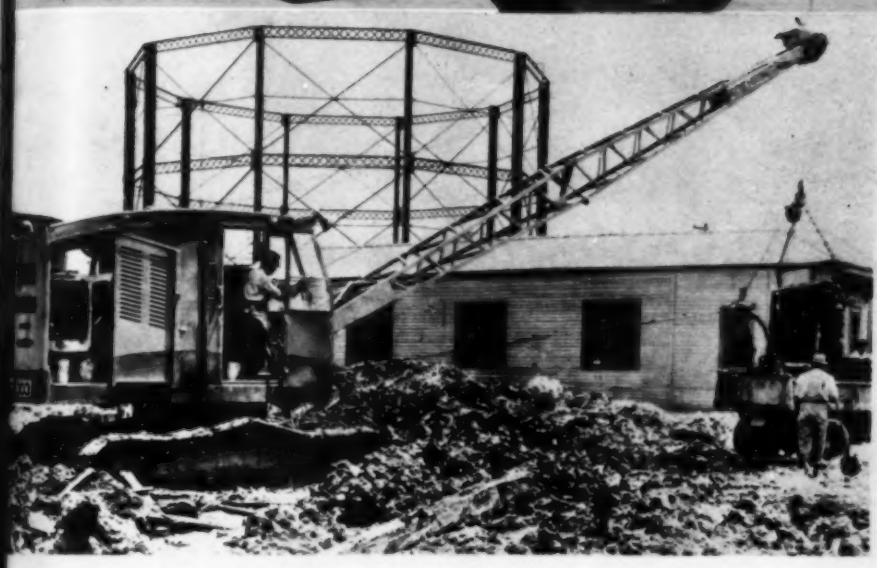
*Cable Address:* "Bobletorno"

*Name registered U. S. Patent Office

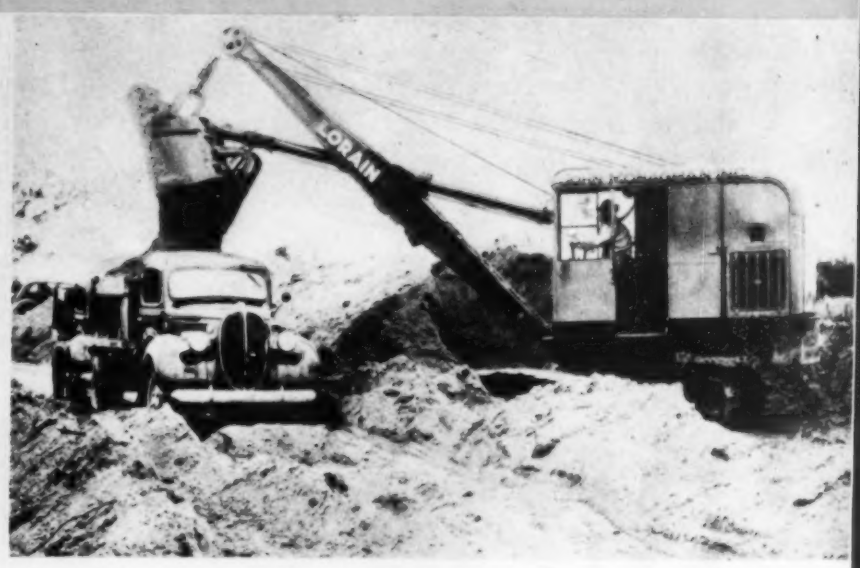
# A NEW "CATERPILLAR" DIESEL FOR SMALL EXCAVATORS



D4600—6 cylinders—69 horsepower at 1550 rpm. with full equipment.



KOEHRING dragline powered by a D4600. Owned by Boh Bros.; working in New Orleans.




LORAIN 40 powered by a D4600—loading top soil on Georgia road construction. Owner, John Monaghan.

IDEALLY FITTED for powering small excavators is this sturdy, smooth-running, new six-cylinder engine. Its design incorporates the same time-proved features which have made "Caterpillar" Diesel Engines famous the world over. Its quick response to variable loads means maximum hourly dirt-moving capacity. With ordinary care, its precision manufacture and quality materials promise long stretches of dependable operation and long serviceable life. Its performance is strictly comparable to that of the larger "Caterpillar" Diesel Engines now being used in larger excavators. Its simplicity eliminates the need of delicate or frequent adjustments. Its frugal use of low-cost fuel makes it by far more economical than any other type of power. And—it is *backed by the most complete and readily available parts and mechanical service of any engine in the world.*

Watch one of these compact "packages of power" in action and be convinced of its outstanding efficiency. Then insist on one in your new excavator. You can get "Caterpillar" Diesel power in all leading makes of shovels, cranes, draglines and other powered contracting and industrial equipment.

**CATERPILLAR TRACTOR CO., PEORIA, ILLINOIS**

BAY CITY dragline powered by a D4600. Working near Marietta, Georgia.

# CATERPILLAR DIESEL ENGINES

REG. U.S. PAT. OFF.

**NINE SIZES—32 to 160 horsepower**

# Why Not Load the Cheapest Way?

*In loading trucks the cheapest way is the best way.*

*let your costs be your guide!*

**Barber-Greene Bucket Loaders have been checked against every other method of loading trucks. They have never failed to show substantial savings. They invariably use less power, require less skill. They save truck time, man time, job time. Their versatility makes them useful the year 'round for all types of loading, stripping, light excavating, and unloading cars. They are available with gravity, shaker or high capacity vibrating screens.**

**The mechanical design and exclusive features of the Barber-Greene place it way ahead in quality, dependability, and ease of operation.**

**Write now for full information. There is no obligation.**

**Barber-Greene Company**
**Aurora, Illinois**

STANDARDIZED MATERIAL HANDLING MACHINES

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BARBER GREENE

BRANCH OFFICES
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Standardized Belt Conveyors
CARRIERS
Portable CONVEYORS
Permanent CONVEYORS
and other standardized unit parts
SNOW LOADERS for high speed removal
MIXERS for Bituminous or Stabilized Mixing · · · Central or Travel Plant
Leveling · Tamping FINISHERS
LOADERS for lowest cost loading
Vertical Boom DITCHERS
Low Cost · High Quality Road Construction

There must be a certain amount of stretch in a wire rope. Otherwise sudden jerks would snap it. But overemphasis on elasticity, or any *single* property, destroys the balance and lowers the general efficiency.

Our eighty-one years of manufacturing experience have taught us how to build in "HERCULES" (Red-Strand) Wire Rope the elasticity to withstand the ever present jolts and jars. To preserve and cooperate with that elasticity we add strength . . . flexibility . . . toughness . . . and durability—all in proper balance, and all working together to make a powerful, dependable, long-lived wire rope that assures you economical performance.

You'll get more out of "HERCULES" (Red-Strand) Wire Rope because we put more into it . . .Why not try it on your next order?

*For Maximum Efficiency in Preformed Wire Rope, Use . . .*

PREFORMED
"HERCULES"*
RED-STRAND
WIRE ROPE

*Available in Both Round Strand and Flattened Strand Constructions*

*Reg. U. S. Pat. Off.

MADE ONLY BY **A. Leschen & Sons Rope Co.** ESTABLISHED 1857

**5909 Kennerly Avenue, St. Louis, Mo.**

New York.....90 West Street
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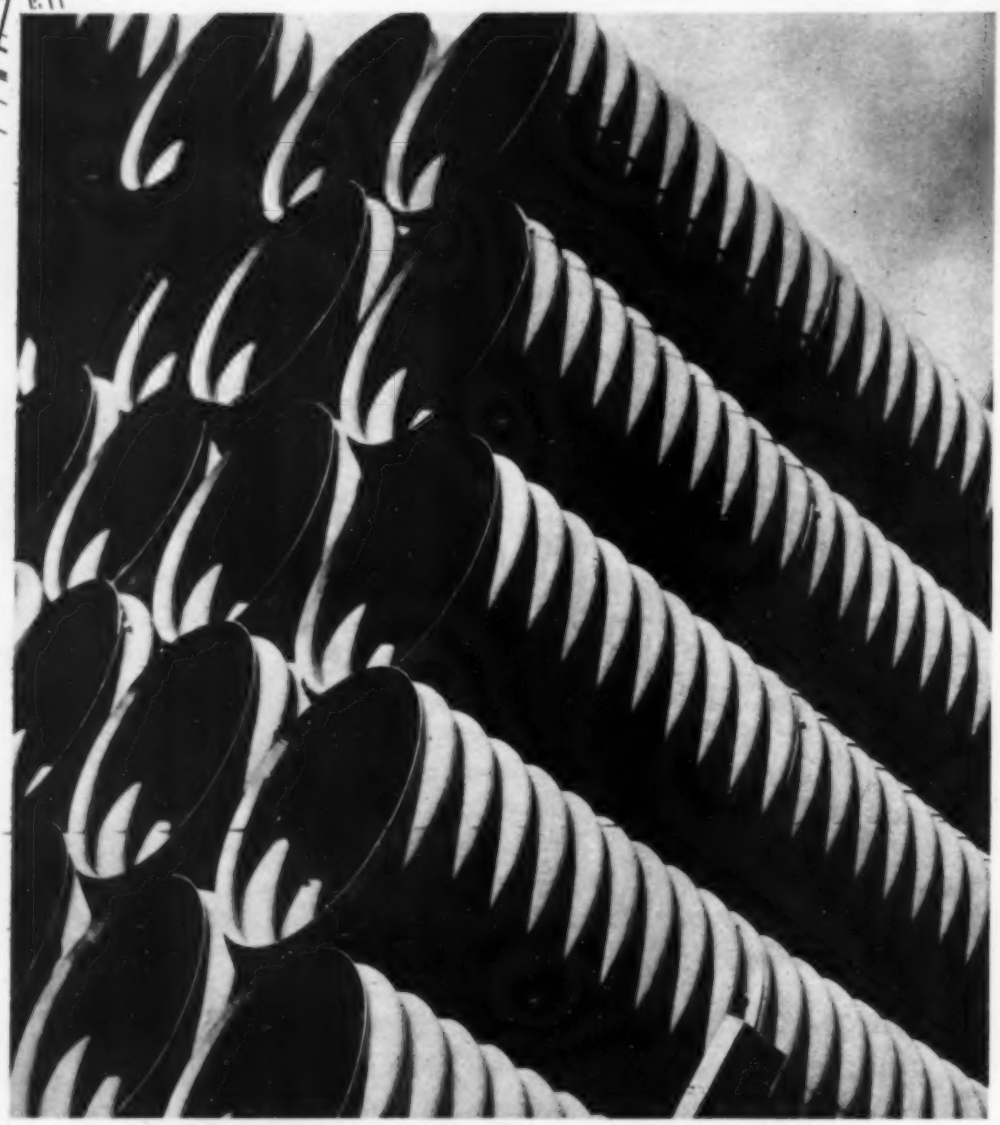
Portland.....914 N. W. 14th Avenue
Seattle.....3410 First Avenue South

# CLOSED FOR REPAIRS!

## . . because Culverts were not installed!



U·S·S COPPER STEEL CULVERTS *drain water out of wet sub-grades, preventing breaks, holes and sunken pavements.*

### Adequate drainage with U·S·S Copper Steel Culverts prevents costly road maintenance.

NO one ever heard of a road with too many culverts — but who hasn't been held up, bogged down or detoured by the road with too few? Poor drainage causes four out of five road failures. Sunken pavements, slides, wash-outs, cracks, chuck holes and frost heaves—all can be blamed on water in the wrong place.

You can prevent much of this expensive maintenance by adequate use of culverts. And, since metal culverts cost less to buy and install, you can afford more of them. U·S·S Copper Steel Culverts save on first cost and freight costs. They can be installed quicker with less labor and require no construction of forms.

Other important features of U·S·S Copper Steel Culverts are their strength, endurance, resistance to fatigue and ability to withstand subsoil changes.

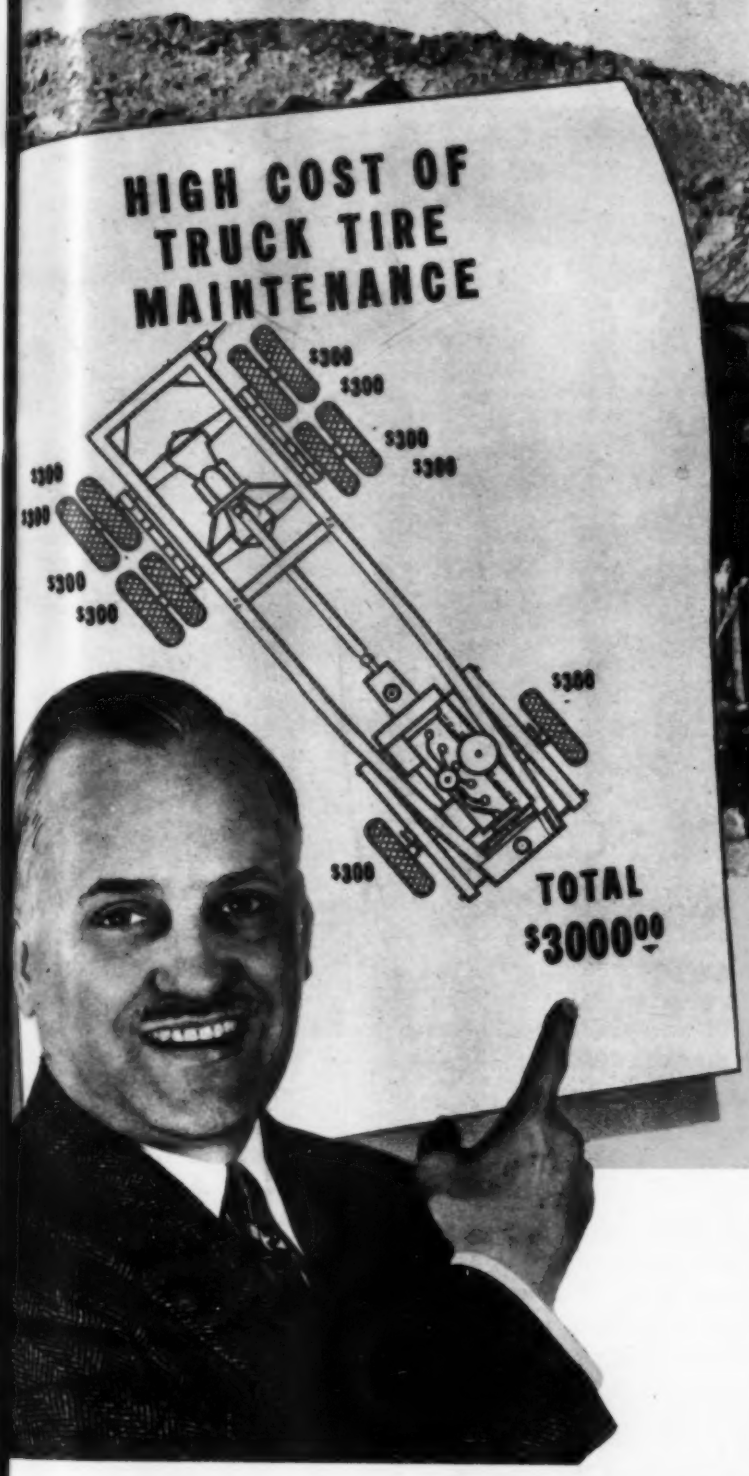
The cost of small bridges, too, can be drastically reduced by the use of U·S·S Sectional Plates. After the foundation is laid, a few workmen can quickly bolt together a perfect arch on which to build the rest of the bridge. This saves time, labor, materials and a considerable amount of engineering work.

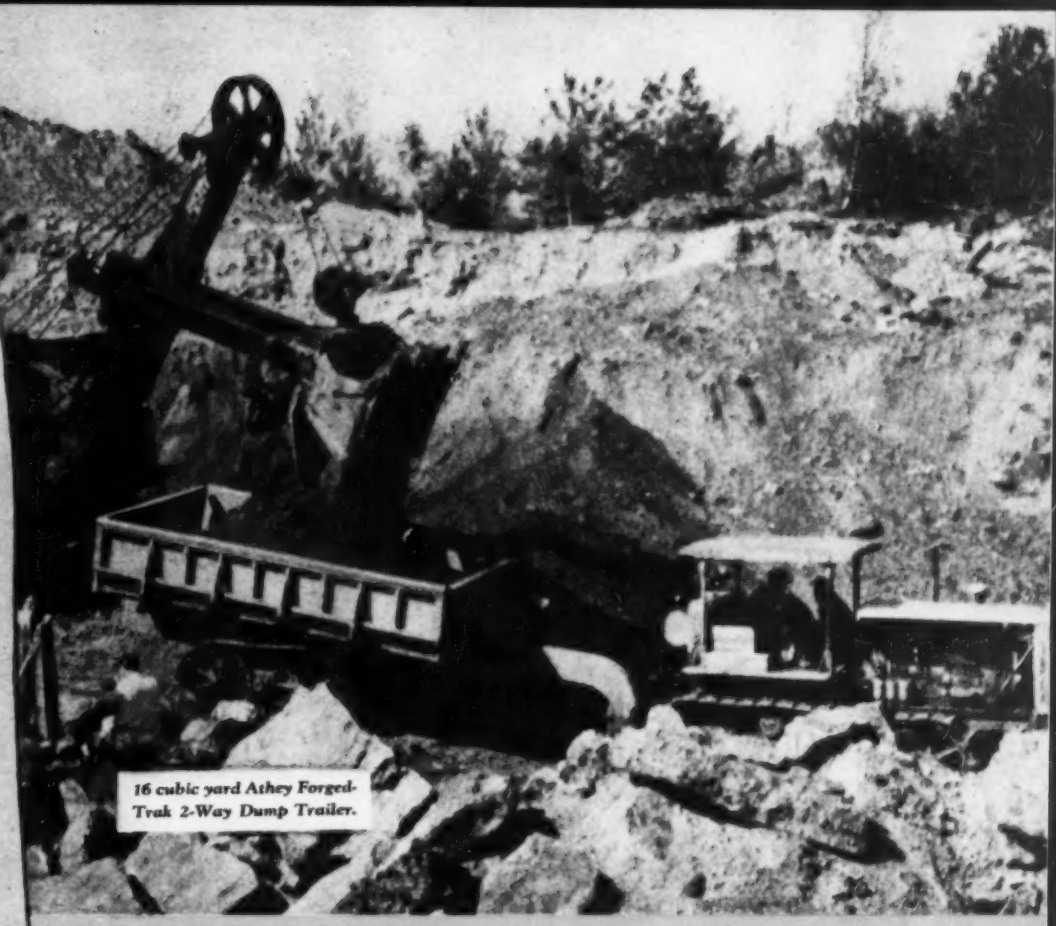
Our new culvert book describes the various kinds of culvert materials and how they should be applied. Write for a copy.

## U·S·S GALVANIZED CULVERT SHEETS

CARNEGIE-ILLINOIS STEEL CORPORATION, *Pittsburgh and Chicago*
COLUMBIA STEEL COMPANY, *San Francisco*
TENNESSEE COAL, IRON & RAILROAD COMPANY, *Birmingham*
United States Steel Products Company, New York, *Export Distributors*

## UNITED STATES STEEL

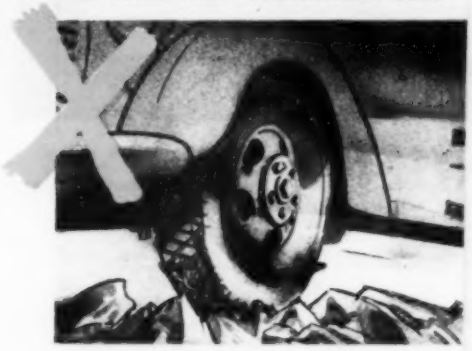




16 cubic yard Athey Forged-Trak 2-Way Dump Trailer.

# "AND THAT'S ONLY ONE REASON WHY WE CHANGED TO ATHEY HAULING UNITS!"

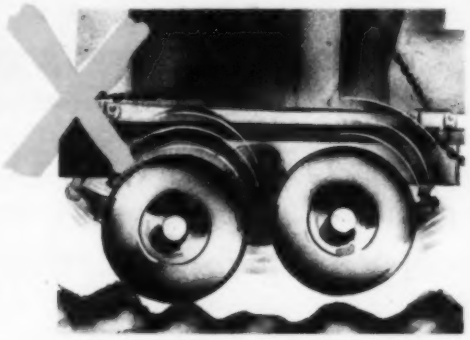
If you haul with trucks, do you actually *know* your tire costs per mile . . . per yard . . . or per hour? If you bought trucks for speed, do you *know* the real average speed your trucks travel *when off the pavement?* Tired of paying for truck repairs they didn't foresee—and speed they don't get—many operators today are turning to Athey Forged-Trak Hauling Units, pulled by "Caterpillar" Diesel tractors. See your "Caterpillar" dealer or write us.

### NO HIGH TIRE REPLACEMENT COST



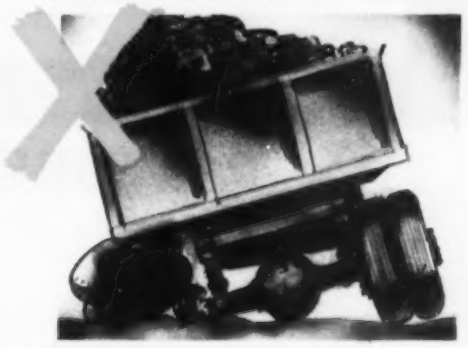
Toughest rubber tires can't stand up under the gouging, gashing and ripping of sharp rocks—frozen chunks of mud, gnarled roots and stubborn stumps! Athey Forged-Trak Wheels are not affected by these rubber tire hazards. They over-ride or beat down all such opposition.

### NO COSTLY ROAD MAINTENANCE



When you use Athey Forged-Trak Hauling Units, you don't need to spend good money maintaining a smooth roadbed. The broad, firm tracks of Athey equipment actually *improve* the road on which they travel . . . surmount or beat down obstacles. And Athey wheels are *non-miring.*

### NO CONSTANT. EXPENSIVE REPLACEMENT



Hauling with trucks means frequent outlay for badly worn and bruised tires, rear axles and other parts . . . replacing the entire hauling unit within a relatively short time. With Athey Forged-Trak Units, you don't have to worry about washboard roads—slippage—overloads that attack tires.

ATHEY TRUSS WHEEL COMPANY, 5631 West 65th Street, CHICAGO, ILL. *Cable Address: "Trusswheel," Chicago*

**ATHEY FORGED-TRAK** REG. TRADE-MARK **ATHEY WAGONS & TRAILERS**

Always for GREATER SAFETY

# Two "ATLAS FIRSTS" combine

## ATLAS MANASITE (the latest "Atlas First" for safety) is now used in

## ATLAS ACCORDION FOLD ELECTRIC BLASTING CAPS

### (an "Atlas First" for safety)

FIVE YEARS AGO, Atlas brought new safety and convenience to electric blasting with the Atlas Accordion Fold Package. The special folding of the wire makes this package easy to use — and also serves to cushion and protect the detonator from external shock.

Now, the margin of safety in Atlas Accordion Fold Electric Blasting Caps is materially increased by the use of Atlas Manasite . . . the exclusive Atlas development that has won immediate acceptance in blasting operations throughout the country.

Atlas Manasite Electric Blasting Caps are more resistant to shock and friction than ordinary electric blasting caps. They offer full detonating efficiency, at no extra cost.

Certainly the combination of these two "Atlas Firsts" marks an important advance in safety. The use of Atlas Manasite Electric Blasting Caps, in Accordion Fold packages, makes safety precautions more effective than ever.

ACCORDION FOLD REG. U.S. PAT. OFF.

Atlas Manasite Blasting Caps and Electric Blasting Caps

## ATLAS POWDER COMPANY, WILMINGTON, DEL.

Cable Address—Atpowco

*Everything for Blasting*

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# ATLAS

EXPLOSIVES

CHEMICALS ATLAS EXPLOSIVES

● Hard to find is the Shovel, Dragline, Crane Operator who wouldn't rather sit in a comfortable adjustable seat and work at short, easy-throw handles and pedals — as on the hydraulically-controlled Link-Belt Speed-o-Matic, which makes the operation as Easy as Driving a Car. By banishing Operator Fatigue, both owner and operator benefit. In other words — Top Speed and More Yardage, With Less Effort. . . . Send for Book No. 1795.

7430-E

**LINK-BELT COMPANY, 300 W. Pershing Road, Chicago** Offices and Distributors in Principal Cities

**LINK-BELT**
***Speed-o-Matic*** **SHOVEL**
**DRAGLINE - CRANE**

# Excellay *Preformed* Wire Rope reduces equipment operating costs

THE construction field is turning more and more to the use of American Tiger Brand EXCELLAY Preformed Wire Rope because its many advantages can be summed up in a single word—*Economy*.

EXCELLAY Preformed Wire Rope is "relaxed." It is free from the internal stresses present in standard rope. This enables it to withstand fatigue to a greater degree. It does not break up so quickly from abrasive wear. It resists kinking and winds smoothly and easily on the drums, reducing uneven wear and drum abuse. It is easier to splice, easier to install, and safer to handle.

Specify EXCELLAY Preformed Wire Rope and get greater value for your money. Our engineers will be glad to cooperate with you.

***You can depend upon the wire rope on the Yellow Reel***

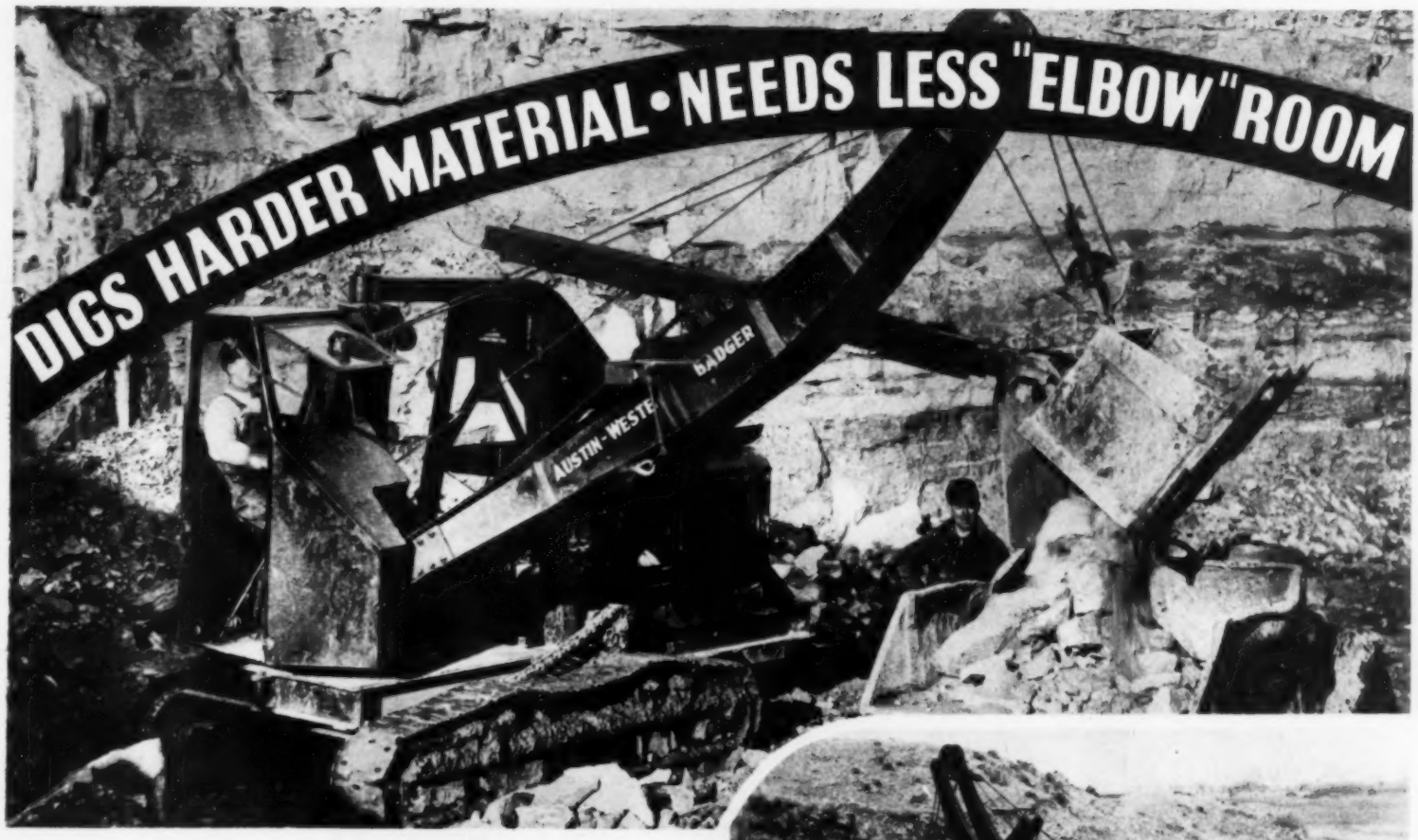
**AMERICAN STEEL & WIRE COMPANY**

Cleveland, Chicago and New York

COLUMBIA STEEL COMPANY, *San Francisco*

United States Steel Products Company, New York, *Export Distributors*

UNITED STATES STEEL



● In frozen ground, clay or other hard materials, the Badger's maximum of 30,000 pounds pressure at the dipper lip gets the dirt out and keeps the job moving. This truly amazing digging power is practical for the ½ yard Badger because of its unusually low center of gravity and the location of the counterweight on the stationary machinery deck.

When opening a cut or widening a narrow road, the Badger may be run close against the bank and operated efficiently. It can cut narrower ditches than a full revolving shovel because no extra material need be moved to provide for tail swing.

Adaptable to every kind of shovel work . . . strong enough for really difficult jobs . . . the Badger assures lower first cost and operating cost than units of equal or greater rated capacities. It swings, starts and reverses faster because motor, machinery deck and counterweight never swing with the boom . . . to sap power, retard speed or add to the cost of operation.

Get the full story of the Badger's versatility and high output applied to your specific type of shovel jobs . . . its exceptional portability . . . its convertibility for crane, dragline or pile driver.

**AUSTIN•WESTERN**

**BADGER**

**½ YD. SHOVEL**

**THE AUSTIN-WESTERN ROAD MACHINERY CO.**
**1818 Barrows Street, Aurora, Illinois**

Tell me more about:

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- ☐ Motor Sweepers
- ☐ Bituminous Distributors
- ☐ Send a Salesman
- ☐ Road Rollers and Roll-A-Planes
- ☐ Motor Graders
- ☐ Blade Graders
- ☐ 12-Yard Scraper
- ☐ 5-Yard Scraper

SH840

*Name*_____

*Address*_____

*City*_____ *State*_____

# —IN WHICH WE PREDICT

## THAT THE INDUSTRY WILL TURN TO WELDED EXCAVATOR DESIGN!

Live Roller Circle rides on a machined path.

● Do you remember when the P&H Pacemakers (all-welded of alloy steels) were announced about five years ago? We saw even then that something drastic had to be done for the construction industry to cut the cost of moving materials. So successful is this new design, that we predict it will become standard in the excavator industry. But that will take time—just as it did for us to perfect the design of these new Pacemakers, presently "five years ahead of the field." There's one of these machines on a job near you. Want to see it in action? Write us. Harnischfeger Corp., 4515 W. National Avenue, Milwaukee, Wis.

**17 DIFFERENT MODELS**
*ranging from 3/8 to 5 cu. yds. capacity with 7 attachment combinations.*
Gas, Diesel or electric power.
Write for literature on the size and type you need.

# HARNISCHFEGER
## CORPORATION

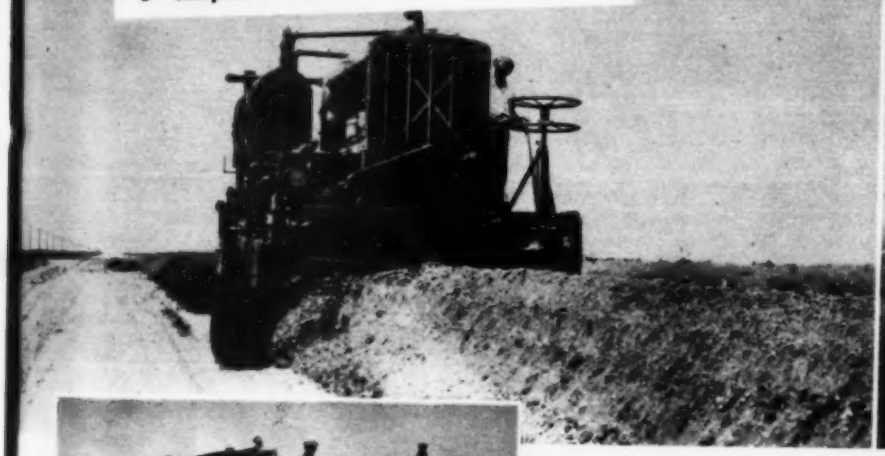
EXCAVATORS • ELECTRIC CRANES • ARC WELDERS **P&H** HOISTS • WELDING ELECTRODES • MOTORS

# HERE'S REAL PRODUCTION ON STABILIZED ROADS--

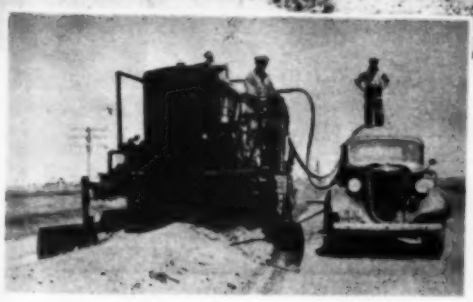
MIXING 12-14 CU. FT. WINDROW FOR 36 FT. SAND-CLAY-GRAVEL BASE AT RATE OF 160-180 TONS AN HOUR WITH JAEGER ROAD BUILDER

**Belt Attachment for Heavy Windrows Produces Even Windrow of Mixed Material Behind Traveling Pugmill—36 Ft. Road Base Kept Clear. Strom Construction Co., Fargo, N. D.**

**...Mixing 14 miles of windrow (approx. 55 tons per 100 ft.) at rate of 5'3" a minute — for 3" compacted base.**



**...Same job from rear, showing material evenly windrowed at roadside, ready for spreading.**



## APPLIES WATER OR BINDER WHILE MIXING

Water to insure optimum content for greatest compaction of sand-clay-gravel or binder material for bituminous mixes is pumped from supply truck moving alongside and accurately measured into pugmill as Road Builder advances.

•

Tractor Drawn Road Builders are available for light retread and stabilization work.

On today's big stabilization programs, more and more contractors are producing both base and top by one-pass mixing with the Jaeger Road Builder.

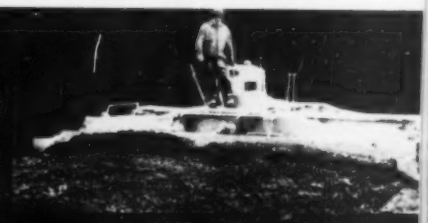
On full-width work, windrows up to 14 cu. ft. are being mixed and re-windrowed by the Jaeger Road Builder at the rate of 60 to 65 ft. per minute — one machine and one operator producing a more uniform and denser mix than can possibly be obtained by blades. On half-widths, Jaeger Leveling Device is being used to mix and finish in a single operation.

Many hundreds of miles of various types of stabilized base and bituminous retread — from Minnesota to Mexico and ranging from 1" retread in 10 ft. widths to 36 ft. sand-clay-gravel stabilized base laid in 3" compacted courses — have been completed by the Jaeger Mix-in-Place Pugmill method. Details of these jobs will gladly be furnished to contractors and engineers interested in bigger production, lower cost and longer-lasting roads. Ask for Supplement MP-38.

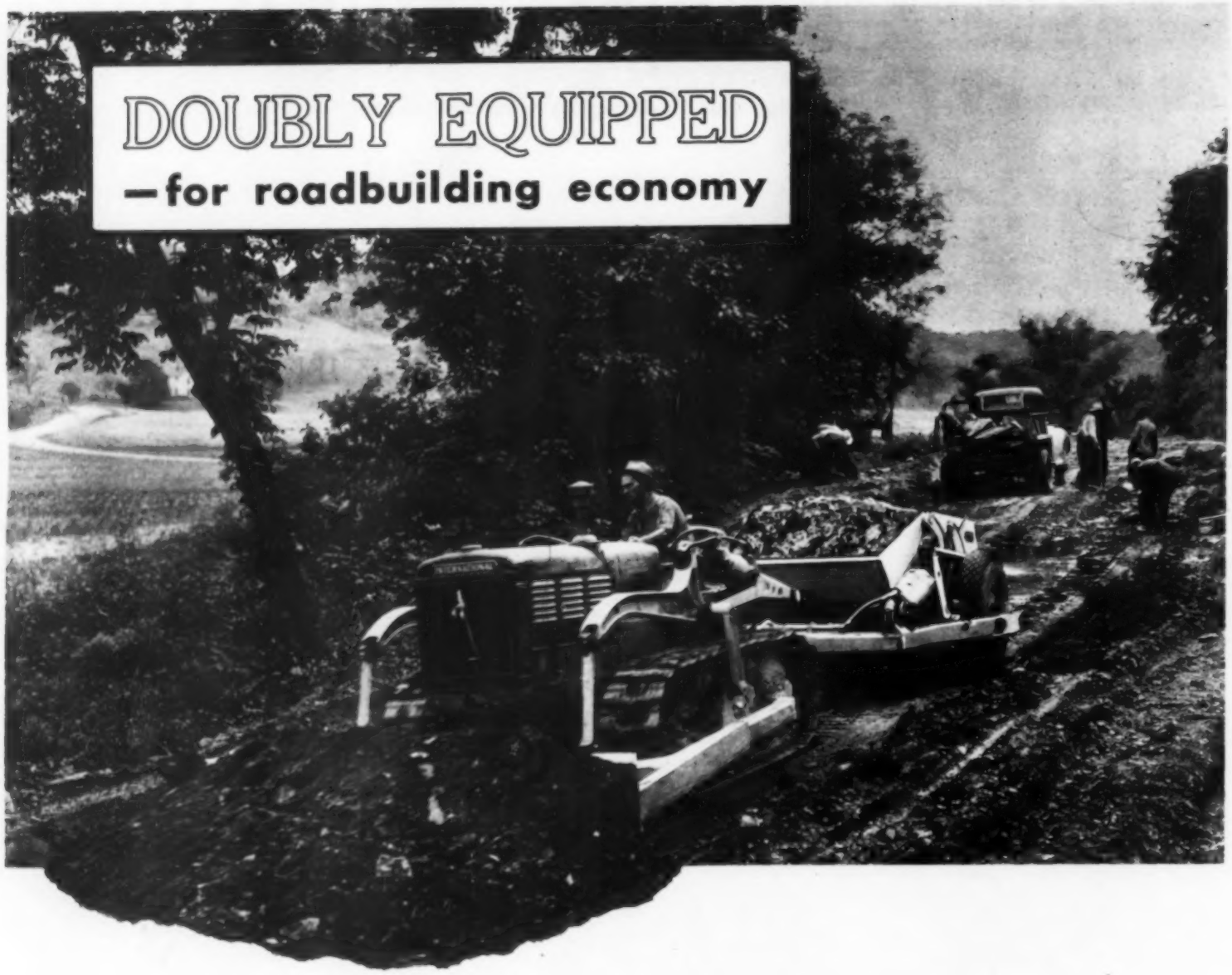
JAEGER BITUMINOUS PAVER
for Precision Smooth Pavements at Low Cost

# JAEGER Mix-in-Place ROAD BUILDER

THE JAEGER MACHINE COMPANY. 800 Dublin Ave., Columbus, Ohio



JAEGER AUTOMATIC FINISHER
for Highest Type Concrete or Bituminous

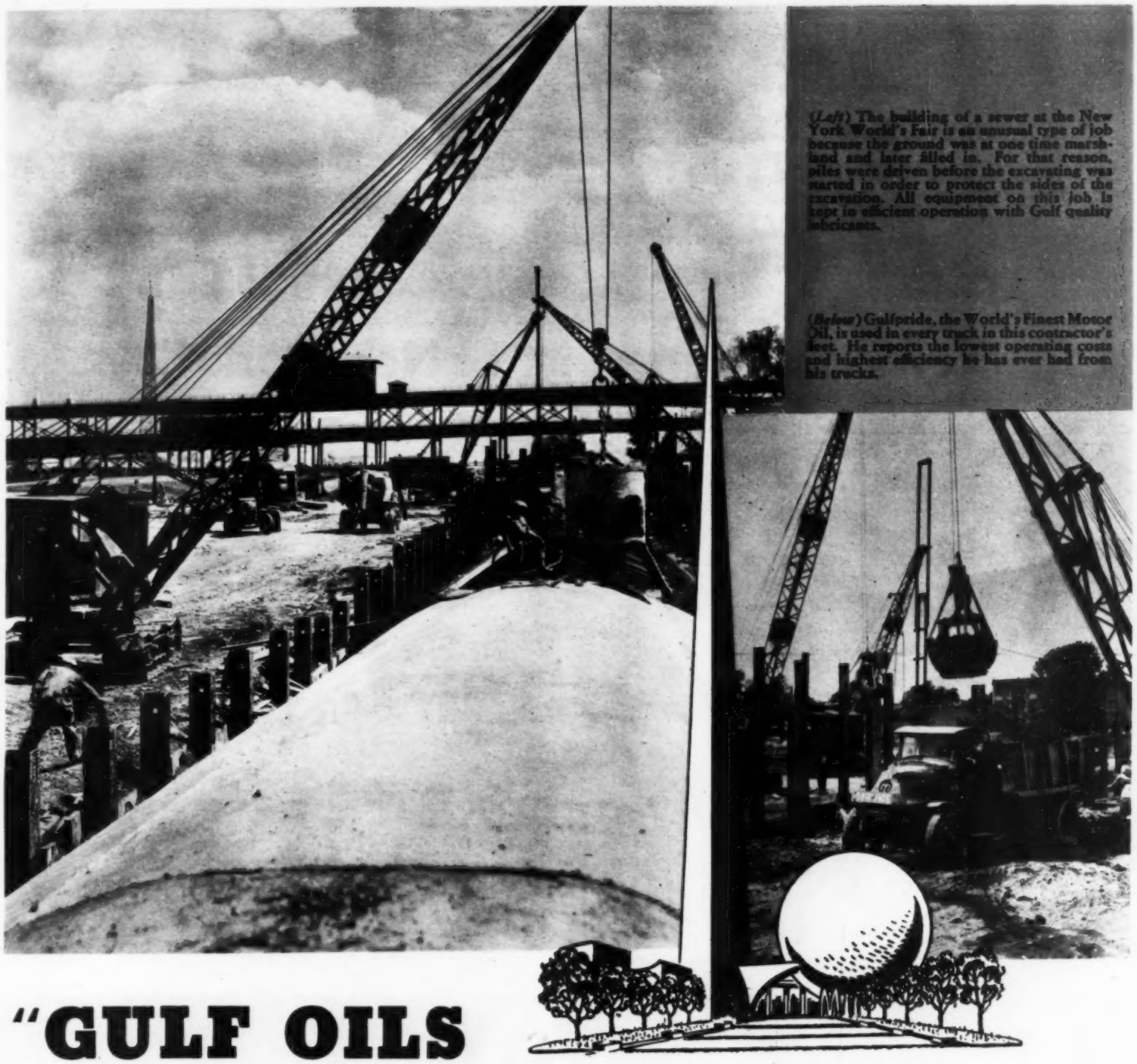



A TRACTOR is only as good as the equipment for which it furnishes power — and with the combination of a Bucyrus-Erie 2-Wheel Scraper and a Bucyrus-Erie Bullgrader, your tractor is "doubly equipped" for maximum usefulness and maximum economy in dirt-moving. On this roadbuilding job the Scraper-Bullgrader unit (1) digs dirt from the cut, (2) places dirt in the fill, (3) levels the fill, (4) keeps hauling roads in good shape, (5) backslopes, (6) builds shoulders, (7) cuts ditches, and performs many other time-saving and money-making jobs. It will pay you to look into the savings Bucyrus-Erie tractor equipment can bring to *your* dirt-moving jobs!

BUCYRUS ERIE

# BUCYRUS-ERIE

SOUTH MILWAUKEE, WISCONSIN, U. S. A.



(*Left*) The building of a sewer at the New York World's Fair is an unusual type of job because the ground was at one time marshland and later filled in. For that reason, piles were driven before the excavating was started in order to protect the sides of the excavation. All equipment on this job is kept in efficient operation with Gulf quality lubricants.

(*Below*) Gulfpride, the World's Finest Motor Oil, is used in every truck in this contractor's fleet. He reports the lowest operating costs and highest efficiency he has ever had from his trucks.

# "GULF OILS

## have proved their ability to give us better service from our equipment" . . . *says N. Y. World's Fair contractor*

"We have tested many brands and grades of motor oil but have never had such outstanding results as Gulfpride has given us with our new fleet of trucks," says this New York World's Fair contractor. "We now have the same enthusiasm for Gulfpride that your engineer expressed when he recommended that we use it a year ago."

This contractor has proved to his own satisfaction that the "best buy" in motor oil is the highest quality oil he can get — Gulfpride. Any contractor who uses Gulf's higher quality oils and greases for shovels, compressors, tractors and trucks will find that the operating economies and freedom from troubles which he enjoys are worth far more than the few cents per gallon saved on the initial cost of cheap lubricants.

From Maine to Texas, Gulf lubricants and fuels are quickly available to you at your job — no matter where it is located. Not only are you sure of prompt delivery but you also have the benefit of lubrication counsel from an experienced Gulf engineer who is qualified to give you the proper recommendations for each piece of equipment you operate. You pay nothing extra for this money-saving service, so why not take advantage of it at once? Gulf Oil Corporation —Gulf Refining Company, Gulf Building, Pittsburgh, Pennsylvania.

GULF INDUSTRIAL LUBRICATION

*Listen to the new Gulf radio program—THE PASSING PARADE, with John Booth Nesbit—every Sunday evening, Columbia network.*

# *Mack* sells Colonial Sand and Stone Company, Inc., of New York City

# *50* new Mack Trucks powered by *Cummins Diesels*

for New York City operation where the average daily runs are only 35 miles.

Colonial purchased *62* additional Cummins Diesels to replace their old gasoline engines. They now own a total of . . . *112*

CUMMINS ENGINE CO., COLUMBUS, INDIANA

**CUMMINS**
*Dependable*
**DIESEL**
PIONEER IN MODERN DIESEL DEVELOPMENT

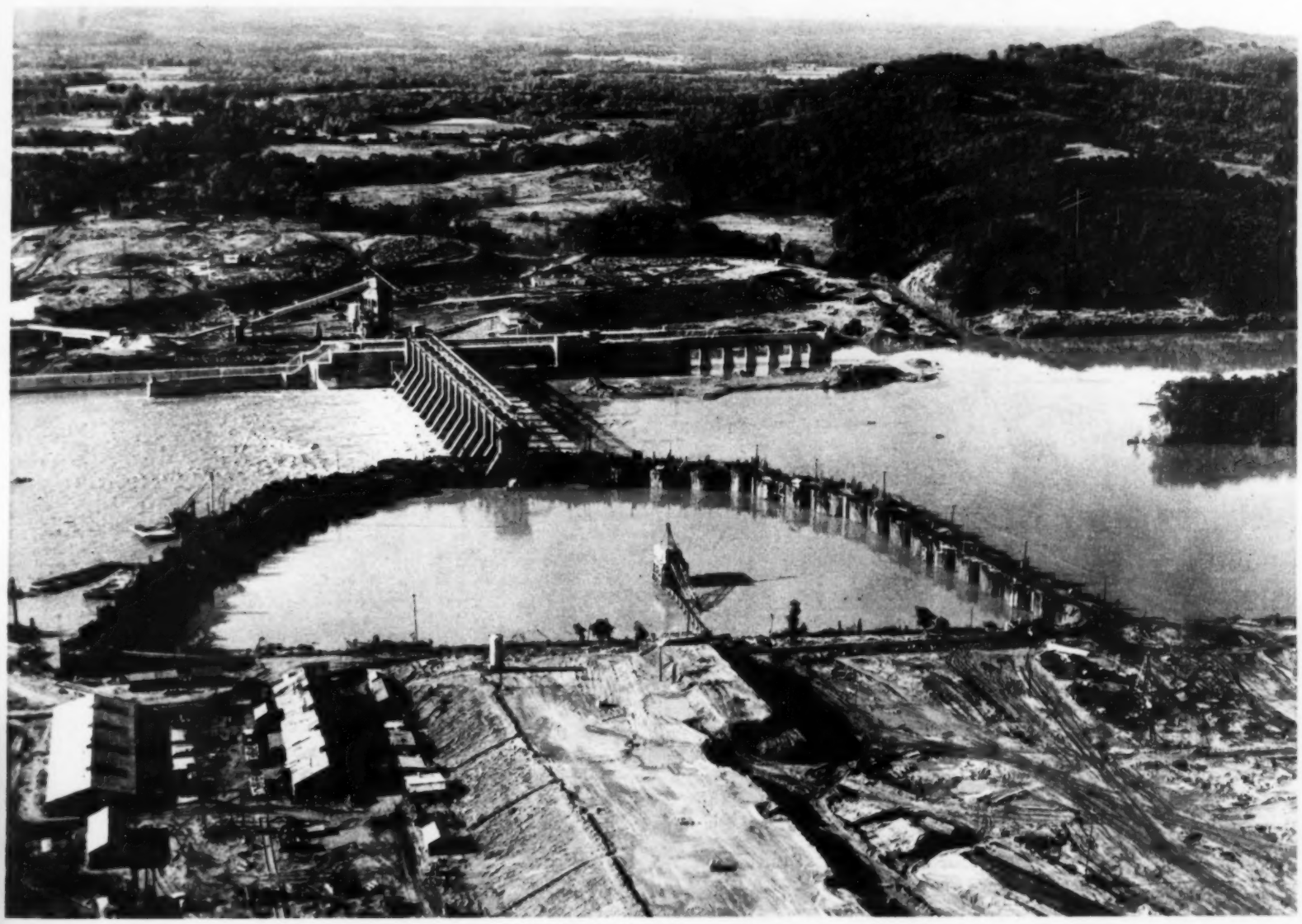
# Construction Methods and Equipment

*Established* *in 1919*

A McGRAW-HILL PUBLICATION

ROBERT K. TOMLIN, Editor

Volume 20 | **September, 1938** | Number 9

# *Last Lap of Chickamauga Dam*

THE FINAL CONSTRUCTION STAGE at Chickamauga dam, TVA project on Tennessee River (see *Construction Methods and Equipment*, July, 1938, p. 40) was reached June 11 with the completion of the third cellular steel sheetpile cofferdam between the spillway section and the left bank of the river, as shown in the photograph above. Lee G. Warren, project engineer, reports "leakage negligible," after cofferdam was unwatered June 23.

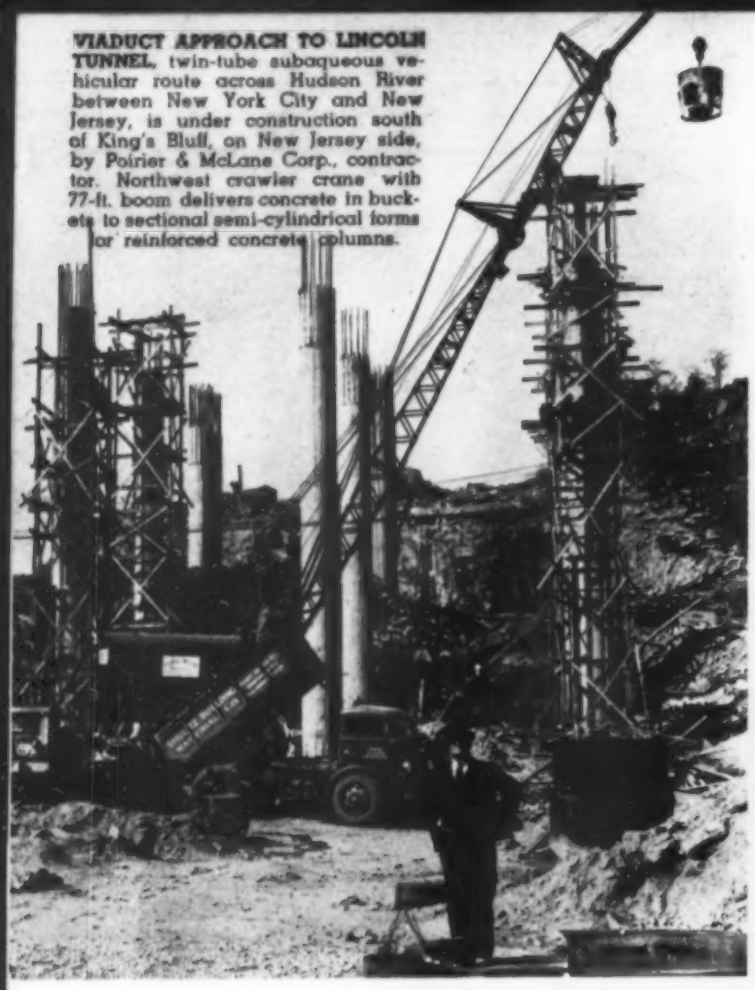
A 20-ton Dravo revolving crane was erected on a rock-fill crib and is plainly seen in the cofferdam area. Erection was made by transferring the crane from barges to the crib.

The outstream arm of cofferdam No 3 joins with bay 14 of the spillway section; 14½ bays of the total of 18 bays have been poured in the spillway. The river is carried over wier sections of first 12 bays poured to within 13 ft. of final height.

The navigation lock, completed and placed in operation in July, 1937, is shown adjacent to the north end of the spillway section and on the right bank of the river. The concrete mixing plant is seen just beyond the navigation lock.

In the immediate central foreground the completed fill for the switchyard is shown. To the right of the switchyard the south side rolled-fill earth dam may be seen. On the left of the switchyard fill the shop and warehouse area is shown.

The third cofferdam includes 3½ bays of the spillway section; the power-house section; the bulkhead section, extending from the power house into the left bank of the river, connecting with the south earth dam; also, both retaining walls, extending upstream and downstream from the power house and adjacent to the left bank of the river. Excavation within the cofferdam was started on June 27.

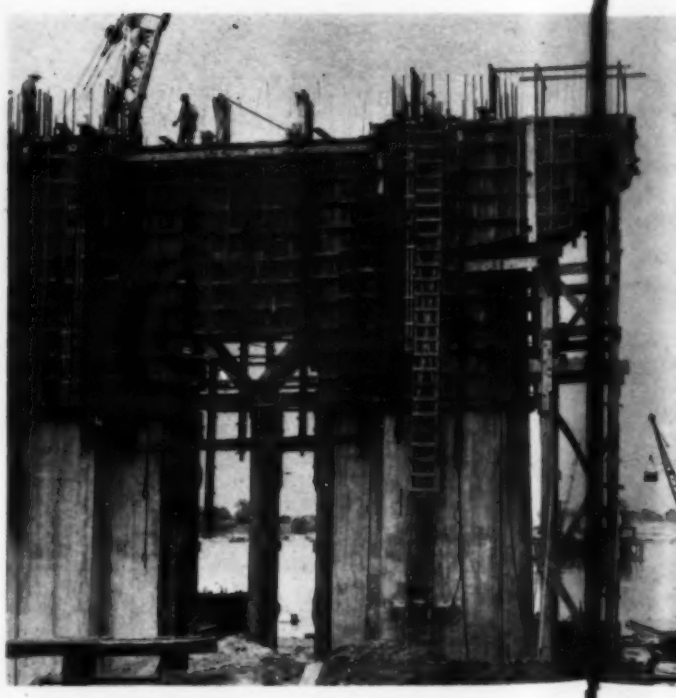


**VIADUCT APPROACH TO LINCOLN TUNNEL,** twin-tube subaqueous vehicular route across Hudson River between New York City and New Jersey, is under construction south of King's Bluff, on New Jersey side, by Poirier & McLane Corp., contractor. Northwest crawler crane with 77-ft. boom delivers concrete in buckets to sectional semi-cylindrical forms for reinforced concrete columns.

**HIWASSEE DAM,** Tennessee Valley Authority's second high storage project, located on Hiwassee River in southwestern North Carolina, reaches first stage of concreting. When completed, structure of gravity type will be 300 ft. above bed of stream, 1,265 ft. long and will require placement of 800,000 cu.yd. of concrete. Within first cofferdam foundations for power house and part of dam are being built. Cableway with towers high up on cliffs above river spans dam site.

# *This Month's* "NEWS REEL"

**MILE-LONG FLOOD SPILLWAY,** lined with 560,439 cu.yd. of concrete, is completed at Fort Peck dam, U. S. Engineer Department project on Missouri River in Montana. Massive structure has 16 vertical-lift gates installed between concrete piers and is designed, in case of a super-flood, to discharge 250,000 sec.-ft. of water into Missouri River channel, shown in background. Gate structure carries concrete highway bridge 86 ft. high and more than 1,000 ft. long. Contractors on spillway were Addison Miller, Inc., and Fielding & Shepley, Inc., of St. Paul, Minn., for gate structure; Massman Construction Co., of Kansas City, Mo., for excavation and lining; and Martin Wunderlich, of Jefferson City, Mo., for excavation of unlined section.



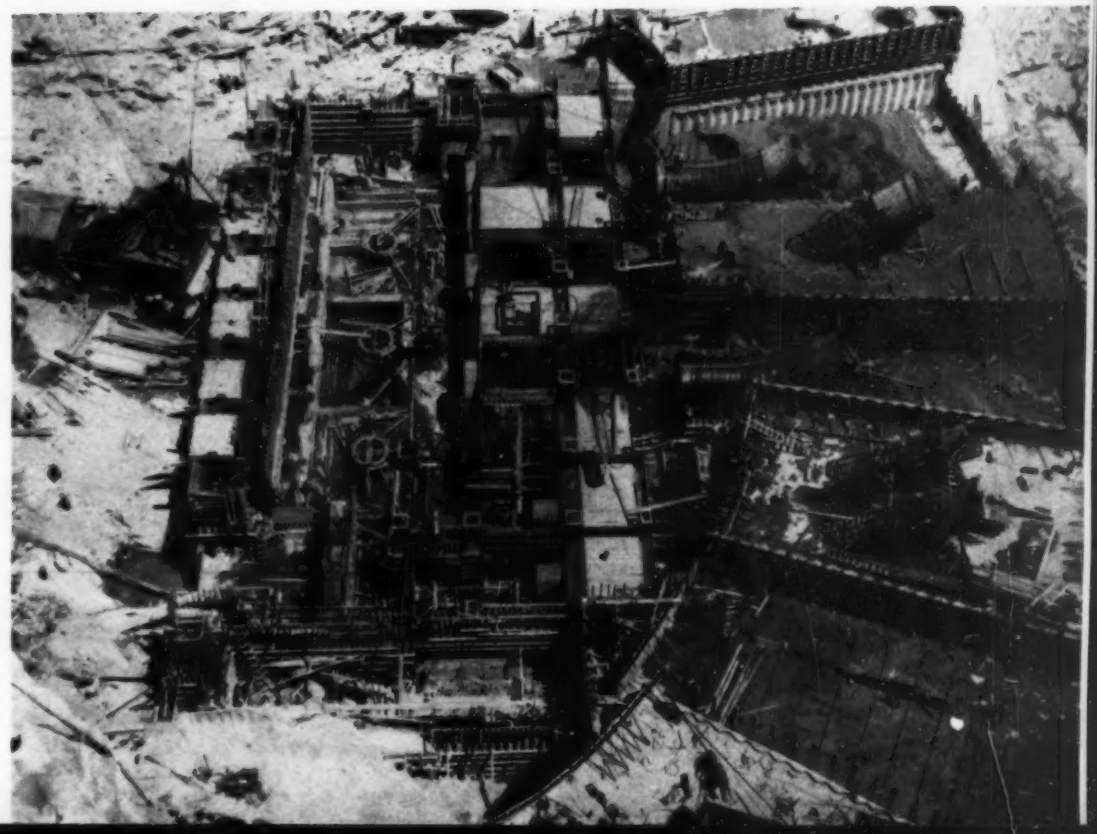
**SIX CONCRETE PIERS** (of which Pier No. 1 is shown in foreground) will carry $8,360,000 railroad and highway bridge crossing Mississippi River at Baton Rouge, La., being built under direction of Louisiana Highway Commission, Harry B. Henderlite, chief engineer and N. E. Lant, bridge engineer. Structure with five river spans of steel cantilever type will have total length, including approaches, of 12,211 ft. Two of river piers, extending to depths of 180 ft., will be sunk by caissons through artificial sand islands retained by steel cylinders, one of which appears behind timber staging supporting forms for concrete pier at river's edge.

**TWIN-SPAN STEEL ARCH (below)** across Connecticut River between Middletown and Portland, Conn., with plate girder approach spans, was completed and opened to traffic Aug. 6. Main spans are each 600 ft. and approach spans total 2,200 ft., giving bridge aggregate length of 3,420 ft. Designed by Connecticut State Highway Department, L. G. SUMNER, engineer of bridges and structures, and D. H. B. STARR, engineer of design. Contractors were Merritt-Chapman & Scott Corp., for substructure, and Bethlehem Steel Co., for superstructure.

**RISING TOWARD FULL HEIGHT** of 270 ft. in narrow canyon of Verde River near Phoenix, Ariz., is Bartlett dam, U. S. Bureau of Reclamation structure being completed by Barrett & Hilp and Macco Corp., under $2,228,272 contract. Dam will be world's highest multiple-arch concrete structure.

**DELIVERY LINE** is completed for 441-ft. lift at Hayfield pumping plant of Colorado River aqueduct, nearing completion by Metropolitan Water District of Southern California. In foreground is inlet structure and trash rack leading from Hayfield reservoir to pumping plant.

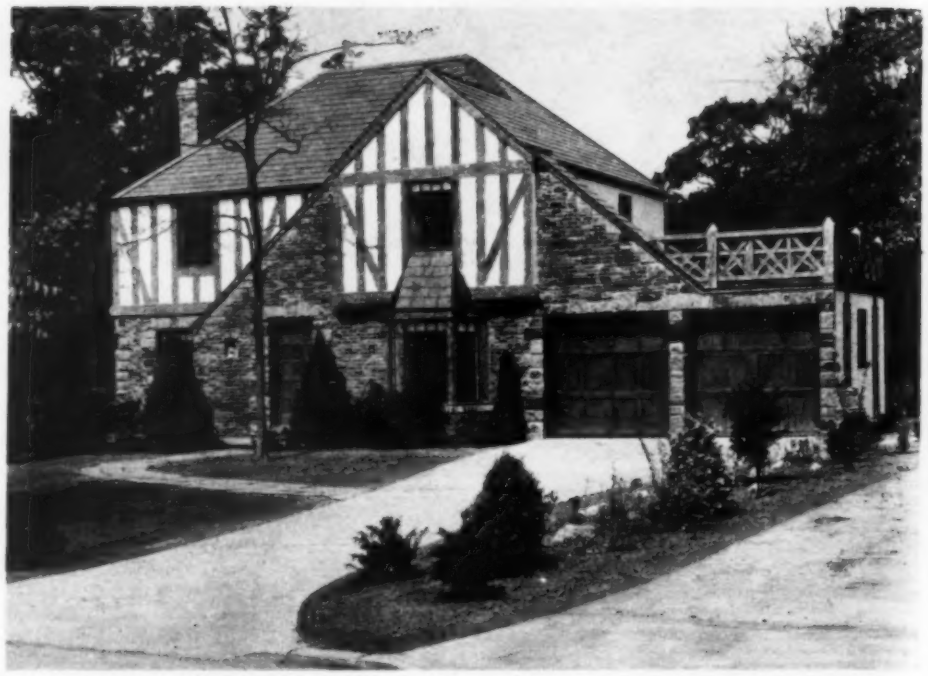
**HALF-MILLION DOLLAR ORDER** for fleet of 50 Mack diesel-powered motor trucks is signed by GENEROSO POPE, president of Colonial Sand & Stone Co., of New York City, as F. F. STANNIFORD, vice-president of Mack Trucks, Inc., looks on with approval. Trucks are powered with Cummins diesel engines.



**LIKE FLOOR PLAN DIAGRAM (right)** is this view of Seminoe dam, 265-ft. high concrete barrier across North Platte River, Wyoming, under construction for U. S. Bureau of Reclamation by Morrison-Utah-Winston-Lawler Co. Backed against crescent-shaped structure is power plant which will have a three-unit capacity of 15,000-hp. turbines and 12,000-k.v.a. generators. Concreting is being done by 565-ft. cableway with moving head and tail towers, handling 4-cu.yd. bottom-dump buckets.

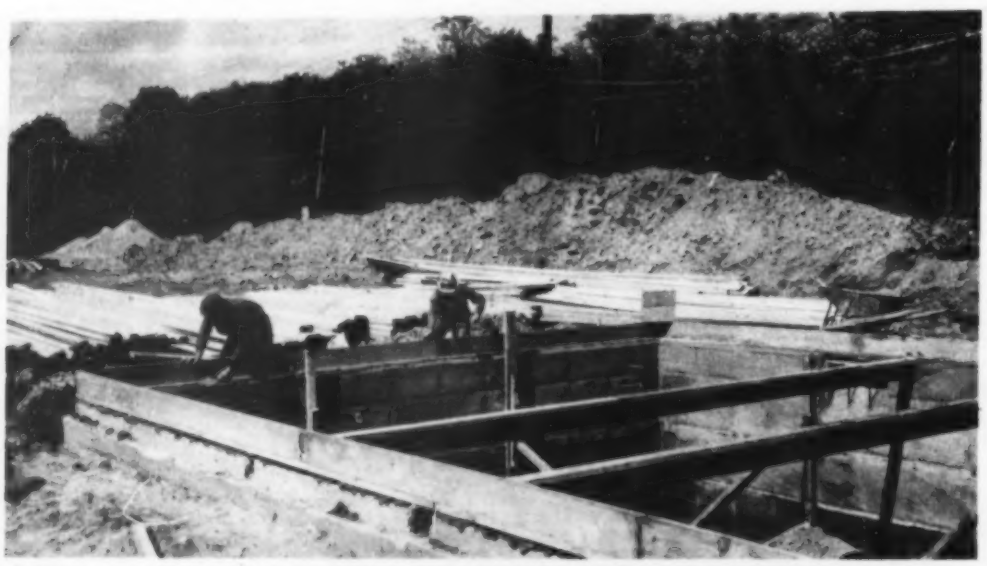
# *Business Methods Applied to* HOUSE BUILDING

**LEVITT & SONS COORDINATE INDEPENDENT SUBCONTRACTORS FOR VOLUME CONSTRUCTION AT LOW COST**



**VARIED TREATMENT** of exteriors dispels any feeling of duplication in houses built from standard floor plan. This house provides four bedrooms, three baths, living room, dining room, breakfast alcove, kitchen, two-car garage — sells for $12,500. Compare it with house of same floor plan on back page of this issue.

**STEEL PANEL FORMS** and 1½-bag mixer serve cement mason contractor in building 8-in. basement walls of 1:3:5 concrete for stucco-veneered houses and 10-in. walls for brick-veneered construction.



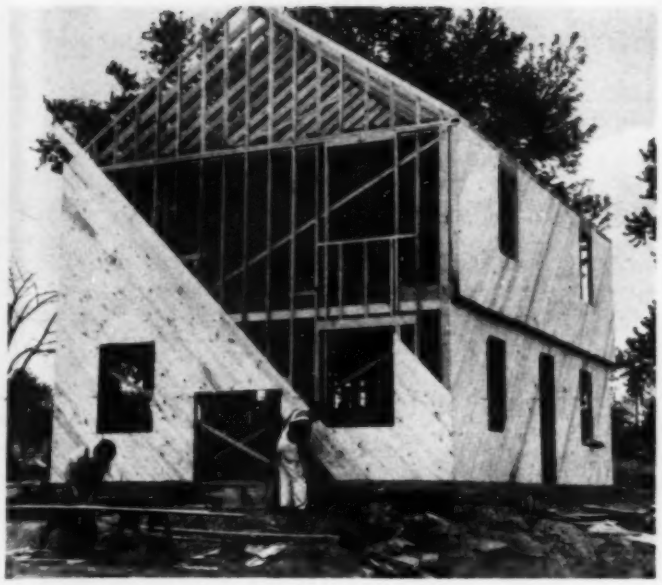
**SILLS** set level by carpenters are slushed in with rich mortar by concrete contractor's workmen. Sills are anchored to masonry with bolts every 8 ft.

BY COORDINATING the various interests of the house-building business in a centrally controlled but loosely knit organization which allows subcontractors and retail supply dealers to retain their independence and normal relationships, Levitt & Sons, suburban real estate developers, of Manhasset, Long Island, N. Y., have found a way to utilize the existing handicraft system of construction for large-scale production of quality houses at moderate cost. The developers buy large tracts of land and build them up into complete communities of separate houses for sale to individual owners. Managing the entire process, from original purchase of the land to final sale of the houses, is a compact permanent organization, designed to operate with a minimum of red tape and office overhead. This organization includes planning and engineering departments which subdivide the property, design the houses, supervise construction and landscape the lots.

*Weekly Payments* — Only three kinds of work — carpentry, rough labor, and landscaping — are done by day-labor employees of Levitt & Sons. All other construction operations are performed by independent subcontractors who have worked with the developers long enough to have become, for all practical purposes, permanent members of the organization. By providing a large volume of work and paying for all work performed, the developers obtain favorable wage rates from day-labor employees and low bid prices from subcontractors. Wages and estimates are paid on Friday of each week, and subcontractors know from experience that the construction department is fair in figuring work performed.

In purchasing materials, supplies and mechanical equipment for the houses, large construction volume and prompt cash payment make it possible both for the developers and for the subcontractors to obtain low quotations and to save discounts. Lumber, cement, hardware, fittings and trim are among the items purchased by the general construction organization; materials and supplies for their own use and installation are bought by the subcontractors.

Through the combined savings of favorable hourly wages, low bid prices from subcontractors, and low cost of materials, the builders are able to erect houses meeting high standards of quality and to offer them for sale at prices which attract the middle-class buyer. In practically every detail of construction the houses



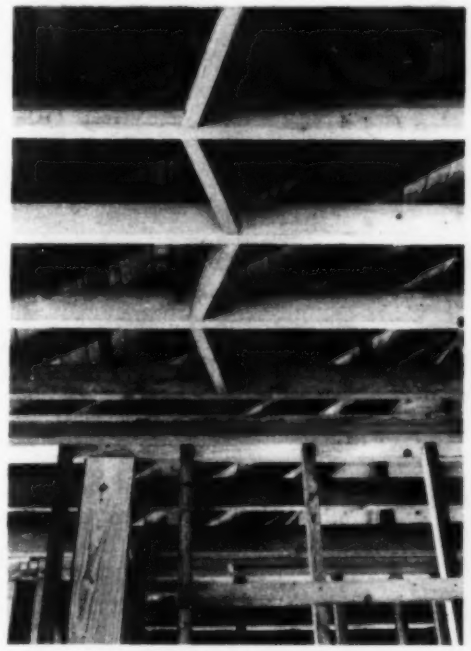
**DIAGONAL SHEATHING** of North Carolina yellow pine is applied to studs of all houses. Balloon framing is standard for less expensive houses. In more expensive dwellings, builders use platform framing.

**BRICK VENEER** is laid up with 1-in. air space between brick and building paper and is anchored to sheathing with galvanized metal ties. Sheathing in more expensive houses is covered with 24-lb. felt; lighter building paper is used in lower-priced houses. All windows are steel casements.

exceed average minimum standards for residences in the moderate-price class. By controlling construction of an entire community, the developers are able to design houses and landscaping of sufficient variety and beauty to assure the home buyer that he is protected in his surroundings.

*House Prices*—Most of the houses in the development are standard units ranging in price from $8,000 to $16,000, although the organization designs and builds many more expensive houses upon order. Prices cover completely equipped houses, including such items as landscaping, mechanical refrigerators, and Venetian blinds. Standard floor plans are available for various price classes, such as $8,000, $9,000, and $10,000 houses. Exteriors of standard houses are varied to avoid any semblance of duplication. For exterior wall facing, the builders standardize on brick and stucco, with exposed timbers used in places for desired architectural effect.

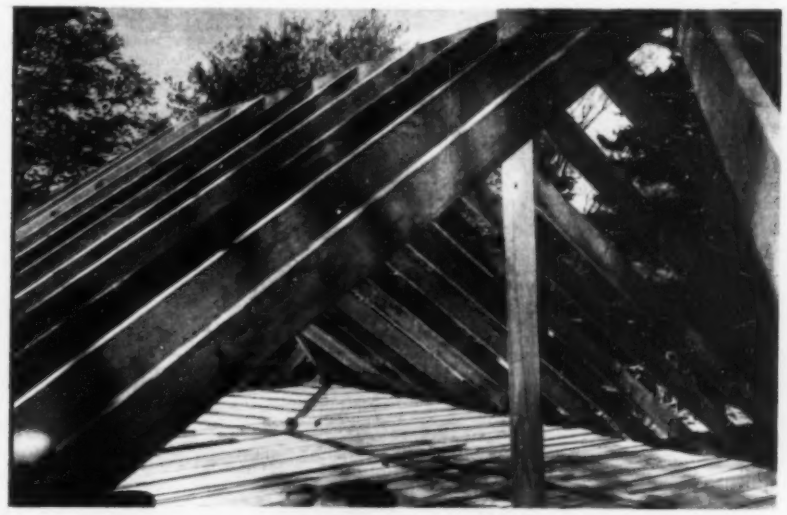
Diversity in prices, architectural styles and house sizes gives the community a variety which cannot be obtained in developments of limited price range. The diversity is an added inducement to the buyer of the $8,000 or $9,000 house and is no deterrent to the purchaser of a custom-made house at $27,000. Both buyers find other houses in the same price class already occupied in the community, and both sense the protection to future



**SOLID HERRINGBONE BRIDGING** between 2x6-in. second-floor ceiling joists provides greater rigidity than cross-bridging.

**A-FRAME** supports interior girder until columns are concreted in when basement floor is placed. Drain pipes have cleanout plugs at ends of all straight runs of piping.

**TRACTOR-BULLDOZER** spreads dumped fill and topsoil around house.

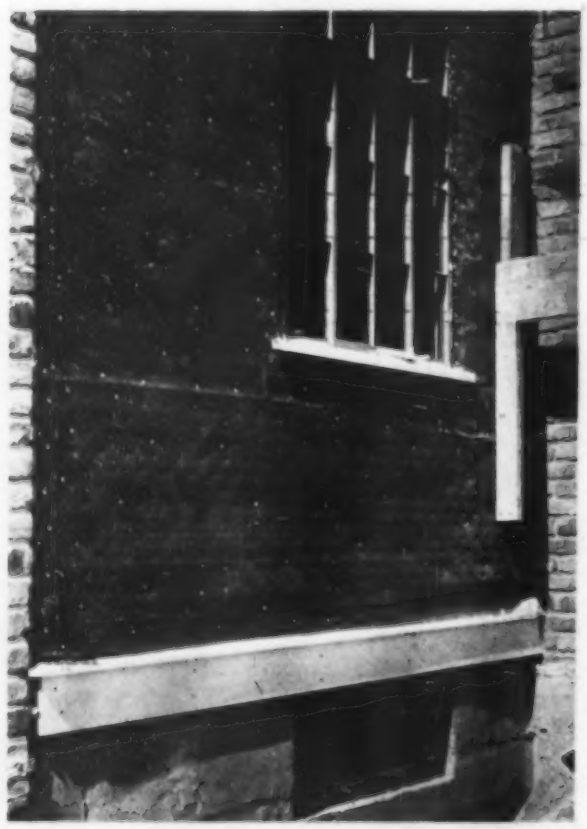


**CLEAN CUTS** with hand saws give full bearing of rafters against ridge board. Hip roof pitched four ways makes ties less necessary in this design, which dispenses with builders' usual practice of using floor joists to tie rafters.

**HIGH VALUE** in minimum-price class is represented by $8,000 houses erected in 1938. Unit has three bedrooms and bath upstairs; living room, dining room, lavatory, breakfast alcove and kitchen downstairs; full cellar; built-in garage.

**BOX-SILL CONSTRUCTION** on basement walls assures uniform shrinkage at exterior bearings and over interior steel girders. Additional floor joist is set between regular joists under partition wall and is braced with solid blocking.

**JOISTS** overlap at spiked spliced point on partition plate. For long spans, joists are 3x8-in. pieces. Bridging between floor joists is not nailed until frame is completed and flooring laid, allowing beams to settle and take normal position.



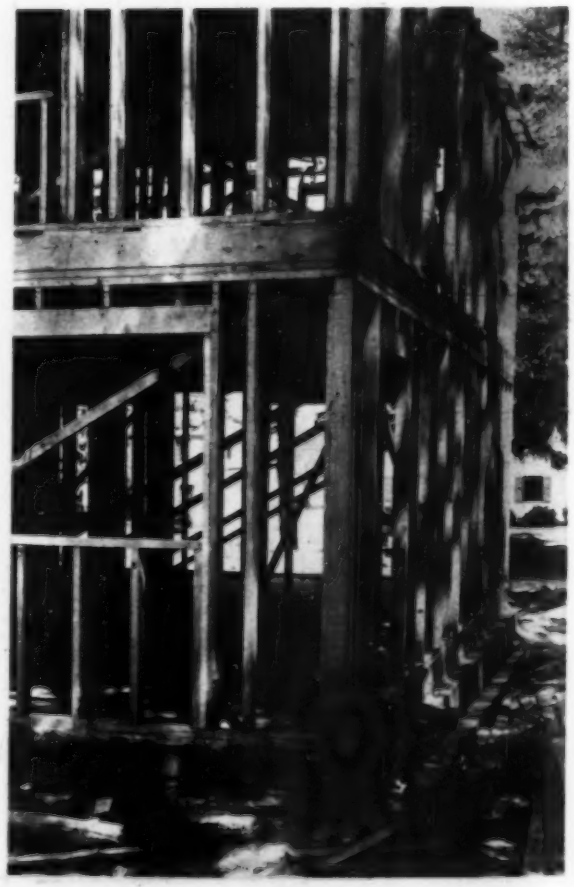
**FOR OUTSIDE STUCCO FACING,** self-furring galvanized metal lath is nailed to felt-covered sheathing.

property values in a controlled development of varied pattern.

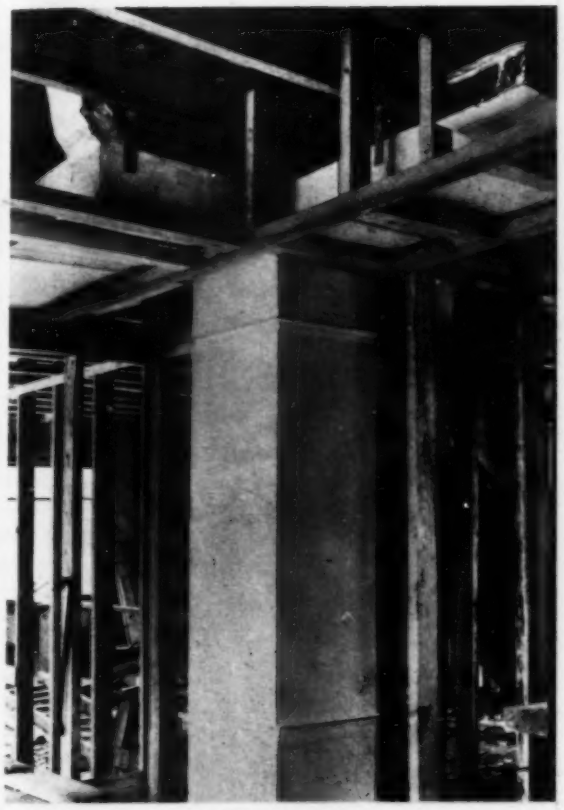
Practically all units in the development are sold in advance of construction from floor plans or sample houses. When a new design is first offered for sale, it is not uncommon for the organization to sell a number of houses from nothing but floor plans and an architect's elevation of the proposed dwelling.

*Builders' Background*—Starting to build houses for sale in Rockville Center, Long Island, just before the business crash in 1929, Levitt & Sons, even in the dull days of the depression, proved the efficacy of buying in a favorable market and putting added value into houses to be sold at modest prices. Their success during the following years had a marked effect in influencing other residential builders on Long Island to adopt higher construction standards.

In 1934 the organization transferred its activities to Manhasset and began the development of entire residential communities on a larger scale. In four construction seasons since moving their headquarters to Manhasset, the builders have developed at this location two tracts of land, totaling 130 acres, on which they have built and



**INDEPENDENTLY FRAMED** floor platforms supported by studs one story in height are characteristic of more expensive houses. Double studs at openings and diagonal subflooring on first floor are standard in all houses.



**RISERS AND DUCTS** of conditioned-air heating system in house are covered with asbestos paper. Single riser suffices for most houses.

**ROCK-WOOL INSULATION** 4 in. thick over heating ducts protects finish flooring above. Temporary handrail on stairs is required for safety..

sold 565 houses. At the same time the organization consumed 40 more acres at two other locations for 130 houses built and sold. A fifth parcel of land, adjoining the second tract at Manhasset, is ready for development next spring.

Fundamentally, the builders look on themselves as merchandisers, their specialty being houses rather than shirts or sewing machines such as other merchants may be using all skill and available knowledge to sell. As merchandisers, they must know and have in stock the articles which the consumer wants — marked at a price which he is willing and able to pay. Close understanding of the consumer market is, as much as any single factor, responsible for the successful merchandising record of the organization. Sampling of this market by means of questionnaires is one method which the builders utilize to learn consumer trends and to ascertain such facts as the price level, say $12,000, above which it is bad business to omit a two-car garage and a maid's room from a house.

During the years since 1929, designs of houses built by this organization have undergone changes in keeping with improvements in such features as heating, air conditioning and insulation, but the older houses retain high sales value today, unaffected by danger of obsolescence or excessive maintenance cost.

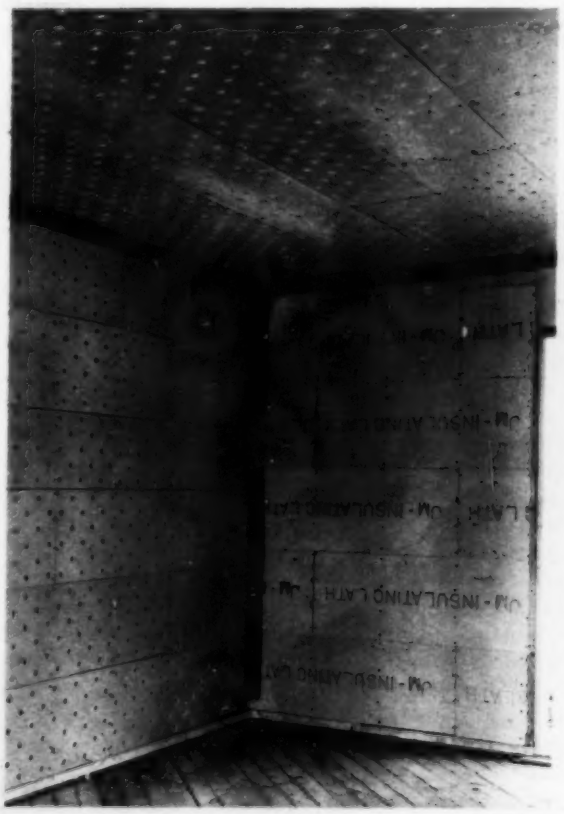
Selling prices have varied with construction costs during the years, any changes in costs, whether up or down, being promptly reflected in the selling prices of the houses. Minimum prices of houses have varied little with the years. The $8,000 house offered in the spring of 1938 represents an exceptionally good value on a basis of cubic unit cost, and the price is a fair average of minimum prices offered in different years. In general, the builders have maintained a fairly uniform minimum price and have altered designs, as required by construction costs, to avoid wide fluctuations in the minimum price.

*Office Overhead* — In spite of the magnitude of its operations, which involve construction of as many as 75 houses simultaneously, the organization keeps itself clear of red tape and unnecessary office work. A small force designs the houses and supervises their construction, and no additional men are employed to make progress charts, draw cost curves, or otherwise interfere with the direct functioning of an order-filling production organization.

When an order is taken for a house, the planning department has to provide only new elevations and an individual color scheme, as standard floor plans, duct plans, and plans showing location of plumbing fixtures already are available. The engineering department, which has previously laid out the lots, locates the house and supervises its construction.

*Budgeted Construction* — In ample time before the annual construction season opens, the builders in conference estimate the expected sales volume, the cost of construction under current and predictable prices, and the amount of overhead which must be distributed into the sales prices of houses to be built. House designs are adjusted to put them in the proper price classes. Detailed records of costs are available in the organization's files to guide the work of estimating and designing to meet price limitations. Bids are taken from subcontractors to fix costs definitely. Once the budgeting is done, construction proceeds on the established price bases until the builders find that, because of falling costs for labor and materials, house prices can be lowered, or until the subcontractors show that, because of rising costs, they cannot make a profit on their original bid prices.

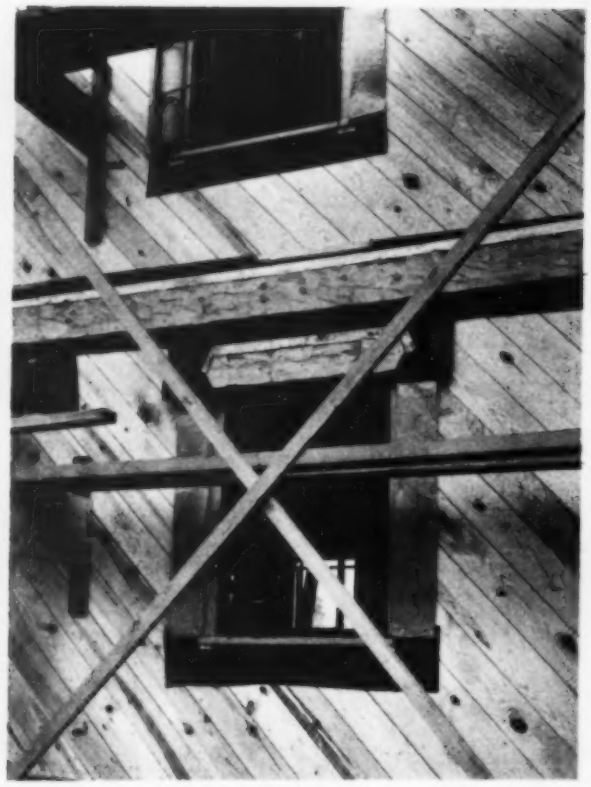
While building houses of standard floor plan for an established price, the organization directs its program toward making an overall profit and



**EXTERIOR WALLS** are lathed with insulating lath, interior partitions and ceilings with perforated rock lath sheets.

**FIREPLACE FRAMING** utilizes 2x6-in. headers to support bearing-wall studs. Ribbon set into studs carries second-floor joists in balloon frame construction.

**GARAGE CEILINGS** receive insulation of 4-in. rock wool, closed in with insulation board. Same thickness of rock wool is used above second floor ceilings to insulate all attics. Heating ducts passing through garages, where they may be exposed to cold air, are covered with 1-in. air-cell corrugated asbestos paper before lathing.



**COPPER FLASHING** protects girth and window head of exposed hand-adzed fir timber. Note also use of copper flashing at window sill corners where leaks are likely to occur. Ample overlap of building paper is provided around window, with 24-lb. felt at top and bottom and tougher kraft paper at sides to avoid cracking.

does not attempt to break down the construction process into itemized costs and protect its profit on each item. If a house purchaser asks for changes to which the standard plan legitimately entitles him, the changes are made without quibbling, even though the builders have to take a loss on the individual house. In the total sales of a group of houses of fixed price, the budgeted selling price is calculated to absorb small losses and yield the desired net profit.

*Subcontractors* — Among the principal items covered by contracts are excavating and grading, cement masonry, brick, plaster and stucco, roofing and flashing, electrical work, plumbing, duct work, weather stripping and caulking, glass, shower doors, and stair rails of ornamental iron. The subcontractors do the bulk of their business on Levitt houses, and many of them make their headquarters on the tract and run other jobs from this location.

By furnishing a large volume of steady work, the builders get the benefits of favorable prices from subcontractors. Weekly estimates, paid promptly every Friday, cut the amount of money which subcontractors must tie up in wages and materials and enable them to buy to better advantage. Contractors bid lump-sum prices in advance for their work on units of standard floor plan. Changes made in a house for the sake of appearance may cause a contractor to lose money on one unit, but in the final reckoning his price enables him to make a profit on a group of houses.

With the exception of the cement mason contractor, to whom Levitt & Sons supply cement, the subcontractors furnish their own materials. Because of their association with a reputable building organization, which pays estimates weekly, they are able to buy large quantities at favorable prices.

*Materials Purchases*—Making their purchases through local dealers and distributors, the general builders and their subcontractors buy in large volume at the best possible price and take advantage of all cash discounts. The developers buy all their lumber from one source, the North Shore Lumber Co., and in an active construction season take two shiploads per month, trucked to the site from the unloading pier in Brooklyn. At the start of the 1938 building season, when 55 houses were simultaneously under construction, the builders had more than 1,000,000 b.-ft. of lumber in storage on the tract.

*Progressive Construction* — Selected areas of the tract are developed as units. In this way, large groups of houses are under construction simultaneously, and the work of the various trades is concentrated to make best use of the mechanics' time. Operations follow no time schedule set down on paper; instead they move ahead as determined by experienced contractors in close collaboration with construction superintendents. The subcontractors push the work through to prompt completion; they require no prodding from the superintendents.

*Working Plans*—The organization's house-building methods comprise a combination of partial standardization in design and complete adherence to conventional trade practices in construction. Practically no attempt is made at prefabrication. Parts are cut and fitted in the field, following age-old precedent among house-building mechanics. At the same time, standardization of floor plans leads to repetition of framing and mechanical details, conducive to an increase in speed of construction.

In their own department of house framing and carpentry work, the builders' years of experience have taught them certain economies. In framing groups of houses, for example, a crew of eight men actually makes faster progress and does better work than much larger crews formerly employed for the same operation. A bonus system which enables the carpenters to earn extra money by completing a house in less than the budgeted number of man-hours is a strong incentive to steady work and rapid progress. The workmen earn a bonus if the job is finished in the budgeted time; their earnings increase if the working time is reduced.

Duct plans are furnished the carpenters for use in framing the houses, and these men quickly acquire facility in reading the plans and making proper provisions for the ducts. The heating plant, supplying conditioned air to all rooms in the house, is centralized to need only one riser (or two, at most) in accordance with a plan developed by Levitt & Sons and

*(Continued on page 61)*

**"PICTURE WINDOW."** presenting unbroken outdoor view to occupants of room, wins approval of buyers, as does inset of structural glass blocks, discreetly used for decoration and additional daylight.

# Window Conditioning *By Double-Glass Insulation* Cuts Fuel Bill For House Heating

**DOUBLE-GLASS INSULATION** may be accomplished with storm sash or winter windows which hang from the same fastenings used to support screens in summer.

**INSULATING GLASS** of double-glazed sash is fitted into special recess provided to receive it and is easily removable for cleaning.

IN DEVELOPING pleasing exterior designs and convenient interiors for houses, and in giving attention to wall and ceiling insulation, architects have overlooked a most important type of insulation. This neglected feature, recognized as a form of insulation which offers much in economy and comfort, is window conditioning (double-glass insulation). It is any practical form of double glazing and may be accomplished with storm sash or with any of the patented types of prefabricated double-glazed sash. Between the parallel panes of glass, a wall of captive air is formed, providing a heat barrier of high insulating efficiency.

Window conditioning is the oldest recognized form of home insulation, for our forefathers used storm sash long before modern wall and roof insulating materials were available. In those days, however, storm windows were used for protection only, and little thought was paid to the appearance possibilities of double-glazing. As a result, the old-time storm windows were bulky and unsightly. Naturally they became unpopular as more efficient heating systems were developed and as more thought was given to exterior appearance.

Today, with the development of modern winter windows and various types of prefabricated double-glazed sash which harmonize architecturally with almost any style of home, window conditioning is gaining favor from the standpoint of appearance as well as of comfort and economy. Like other forms of building insulation, double-glazing pays for itself in fuel savings. Prof. G. L. Larson, of the University of Wisconsin, has shown that, with fuel savings of 30 per cent, it took less than two heating seasons for window conditioning on his test home in Madison, Wis., to pay for itself.

Obviously, the amount of fuel saved by window conditioning will vary with such flexible factors as type of construction, location, and weather conditions. Generally speaking, however, it may be stated that window conditioning reduces fuel bills from 20 to 30 per cent—and it should be noted that, when other insulation is used, window conditioning adds the above savings to those effected by the other insulation.

Another advantage claimed for double-glass insulation is that it permits healthful indoor humidity to be maintained without the annoyance of fogged windows or excessive moisture condensation, even in coldest weather. This is particularly important in view of the increasing use of winter air conditioning, or humidifying systems.

***Extra Jobs for Building Contractors***

**can be developed by selling to local house owners the advantages of double-glass insulation, as outlined in the accompanying article.**

**PREFABRICATED TYPES** of double-glazed sash have an extra or insulating sheet of glass which is readily removed for cleaning or storage. Insulating wall of captive air is created between panes.

# DEEP PIERS *Carry Baton Rouge Bridge*

THE NEW $8,360,000 combination rail and vehicular bridge under construction at Louisiana's state capital, Baton Rouge, marks another important conquest of the lower Mississippi river by engineers and contractors. Contracts for the structure were let in July of 1937, and the bridge will be opened to traffic early in 1940. Several engineering problems were encountered in plans for the Baton Rouge bridge which were not present when the Huey P. Long bridge at New Orleans was built. The present structure, with approaches, measures more than 2 mi. in length.

Upstream from New Orleans 100 mi. or so, the Baton Rouge bridge will replace the old ferries which for decades have carried traffic back and forth across the river at a great loss of time and money. The bridge will remove one of the last obstacles in one of the shortest highway routes across the United States and will link two federal highways, U. S. Routes 71 and 190.

Louisiana Highway Commission engineers planned the entire structure and are in charge of supervising its construction. It is a combination highway and railway bridge which will have a single-track railroad through the center of the structure with a cantilevered highway driveway 20 ft. wide on each side of the railroad track. Sidewalks for pedestrians will be built on the outside of each driveway.

The bridge consists of a main river bridge made up of through-truss cantilever spans and viaduct approaches of steel plate-girder spans on steel tower bents. The main river structure extending from the high bank on the east side of the river to the levee on the west side is 3,326 ft. long, and consists of five spans. Two of these spans are 848 ft. long, two are 490 ft. and the other is 650 ft. The main river structure provides, at high water, a vertical clearance for navigation of 65 ft., and at low water a clearance of 113 ft. The main river spans

**RAILROAD VIADUCT** of steel deck plate girder spans on east bank of Mississippi River form 3,586-ft. approach to main river structure.

**ARTIFICIAL SAND ISLANDS** (in background), retained by steel cylinders 120 ft. in diameter, will provide means of sinking caissons to depths as great as 180 ft. below water level to support piers of river crossing. In foreground is floating concrete plant with tower and chute.

are symmetrically arranged so that in the center there is a 650-ft. span flanked on each side by an 848-ft. span, with shore spans on each end of 490 ft. Each of the 848-ft. spans provides a horizontal clearance for navigation of 820 ft.

The viaduct approaches on each side of the river consist of alternate 83-ft. and 43-ft. deck plate-girder spans supported on steel tower bents. The length of the viaduct on the east side of the river is 3,586 ft., and on the west side 5,299 ft. The maximum rate of grade on the highway approaches is 5 per cent and the maximum rate of grade on the railroad viaduct approaches is 1.25 per cent.

The entire structure from abutment to abutment is to be 12,911 ft. long, and the total contract cost of the four contracts involved in the structure is $8,360,000. The Kansas City Bridge Co. is building the six main river piers which will support the five main river spans; this work is scheduled to be finished by De-

cember, 1938. For the river piers caissons are sunk through artificial sand islands retained by cylindrical steel shells 120 ft. in diameter. For several months, the Bethlehem Steel Co. has been fabricating steel for the superstructure of the bridge at its plant in Pennsylvania; erection probably will be started late this summer or fall. The substructure of the approaches to the bridge is being built by the Uvalde Construction Co., of Dallas, Tex.; the contractors have finished the east side approaches and are working on those on the west side of the river. Many carloads of fabricated steel have already been shipped to Baton Rouge for use on the superstructure of the bridge approaches, which are being built by the Steel Construction Co., of Birmingham, Ala.

An average of approximately 600 men per day is employed at the bridge site on the three contracts which are now active. This does not include the men employed in the fabricating shops at Birmingham and at Pittsburgh.

The quantities and principal materials involved in the bridge are as follows:

| | |
|---|---|
| Structural steel, including carbon steel, silicon steel and cast steel | 65,191,000 lb. |
| Reinforcing steel | 5,532,000 lb. |
| Concrete | 94,490 cu.yd. |
| Precast reinforced concrete piling | 208,200 lin.ft. |

In comparison with other Mississippi River bridges the Baton Rouge bridge will have the deepest foundations in that two piers will be sunk to a depth of 180 ft. below mean Gulf level, using the sand island-caisson method previously used on the Huey P. Long bridge. The two main cantilever spans, 848 ft. long, will provide the greatest horizontal clearance for navigation of the bridges over the Mississippi. The vertical clearance of 65 ft. above high water will be as great or greater than any of the other Mississippi river bridges except the Huey P. Long bridge at New Orleans, which provides a vertical clearance of 135 ft. for ocean-going steamers. Since the Baton Rouge bridge is located above the head of deep water navigation it was only necessary to provide 65 ft. clearance for river-going traffic.

A feature of the Baton Rouge bridge is the symmetrical arrangement of the main river spans about the center of the river. This bridge also has the distinction of being the largest project in which the U. S. Bureau of Public Roads has participated in its entirety, receiving from this same department the largest allotment of federal funds it has been willing to allot to any one project.

The entire project is being financed by Louisiana Highway Commission funds and is supplemented by regular federal aid from the U. S. Bureau of Public Roads. Complete topographic, hydrographic surveys, foundation borings, construction plans and specifications for the entire project were made by the Bridge Department of the Louisiana Highway Commission, and all engineering supervision of construction is being done by this department.

The Louisiana & Arkansas Railway Co. has signed a lease agreement to use the railway portion of the bridge after it is completed, and it is also anticipated that the Missouri Pacific Gulf Lines will also make use of this structure. The railroads using the bridge will do so on an annual rental basis and all highway traffic will use the bridge toll free.

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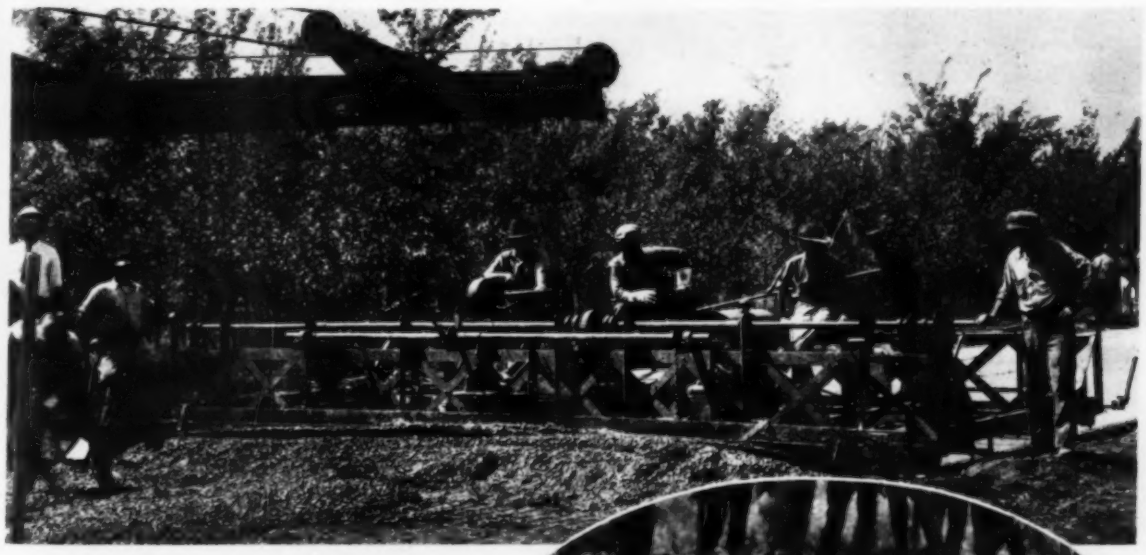
# *Wide Pavement Screeded and Jointed by* Single Machine

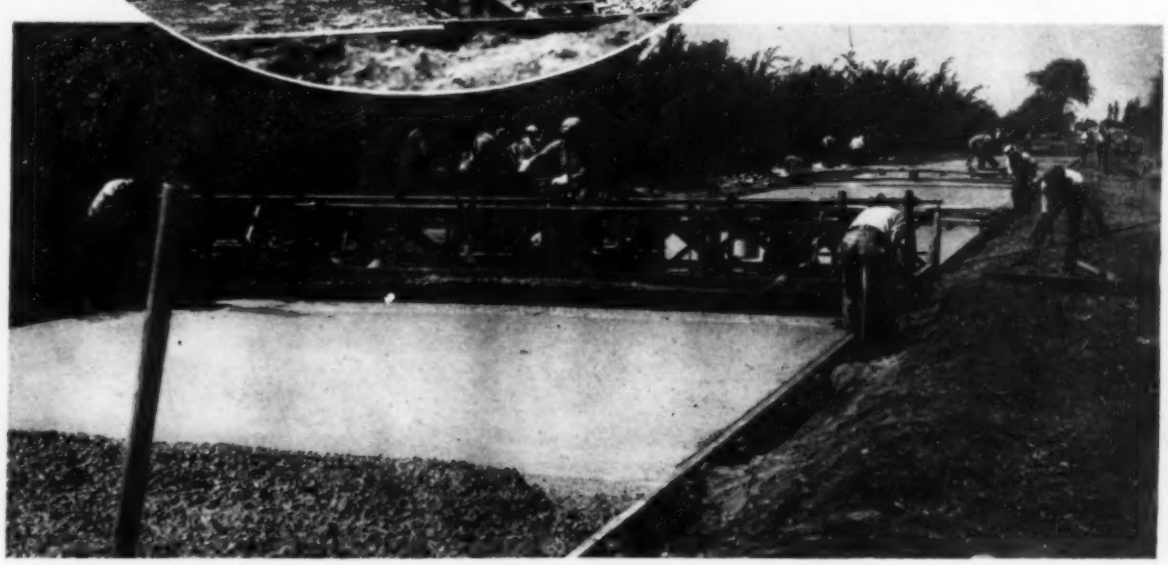


**COMBINATION SCREEDING** and installation of longitudinal and transverse contraction joints is done by single machine covering 22-ft. width of slab.

THE accompanying photographs illustrate details of Flexplane mechanical equipment employed by George S. Mellert-Weidner Co., contractor, to lay finish and joint concrete pavement 22 ft. wide on Bacon Road, at Painesville, Ohio. Dowel bars and transverse expansion joints were placed across the 22-ft. paved width by the "spotter" device shown. After concrete was deposited the steel dowel bars were released and the spotter removed. The expansion joint holders, however, remained in place until the final pass had been made by the finishing machine.

A single combination machine did the screeding and installed the longitudinal and transverse contraction joints, involving the placement in the concrete of a ⅛-in. premolded ribbon.

**STEEL DOWEL BARS (left)** are "spotted" by mechanical device which also holds expansion joint filler in place.



**SECOND PASS** of screed **(right)** is made while ⅛-in. premolded ribbon is also placed in longitudinal and transverse joints.

# Truck Mixers in Stationary Plant

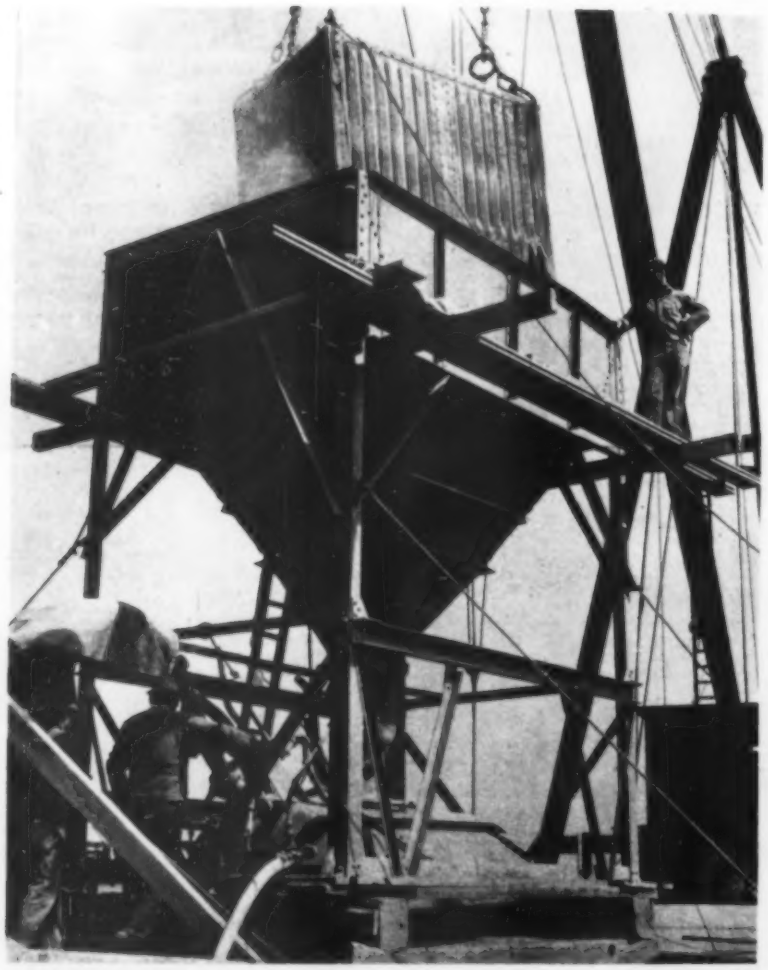
## *Build Cable Anchorages for*

## Bronx-Whitestone Bridge

**L.C.L. CONTAINERS** holding 25 bbl. of cement are picked up and dumped by floating derrick into bin mounted on same hull.

TWO 5-YD. TRUCK MIXERS set up in a stationary plant at the Bronx anchorage of the Bronx-Whitestone bridge, New York City, produced concrete at the rate of 90 to 105 yd. an hour for the 30,000-yd. U-shaped structure, built by the Corbetta Construction Co. as part of a $900,000 contract, which includes the Queens anchorage as well, for the Triborough Bridge Authority. A belt conveyor delivered aggregates and a pipe carried cement from the head of a pier running to deep water offshore, where materials could be unloaded from barges. Production of the mixing plant was distributed into the anchorage forms in about equal proportions by a double-chambered concrete pump and by a 4-yd. bottom-dump bucket handled by a steel stiff-leg derrick on a tripod tower.

In addition to supplying concrete for the anchorage, the plant also batched materials for a fleet of three 4-yd. truck mixers hauling to approach piers and end ramp of the bridge project. These structures were built under separate contract by the Corbetta organization. Concrete requirements for the approach work ranged from 20 to 60 cu.yd. per hour, and the total concrete production batched out of the plant therefore amounted to as much as 150 cu.yd. an hour throughout the greater part of each day. This rate of production demanded delivery by the aggregate and cement conveying systems of more than 200 bbl. of cement and more than 250 cu.yd. of aggregates



**BULK CEMENT** drops from L.C.L. container into bin which feeds 20-bbl. charges through air-controlled gate to cylindrical tank of air-activated conveying system.

**AGGREGATES** unloaded from barges by floating clamshell derrick drop from steel bins on to 24-in. belt.

per hour. Storage bins with capacities of 450 bbl. of cement and 75 cu.yd. of aggregate provided reserves to take care of fluctuations in delivery from the pier head. Working on a one-shift basis, the plant placed 1,150 to 1,300 cu.yd. per day in the anchorage and during the same shift batched up to 350 cu.yd. for the approach structures.

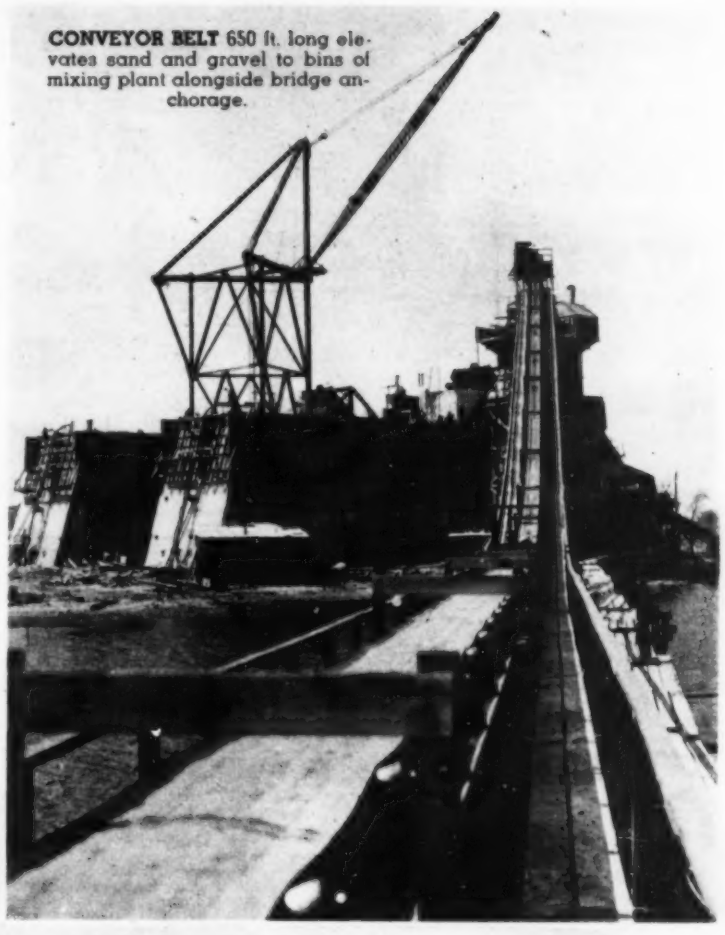
*Concrete Plant* — Two 5-yd. truck mixers have a productive capacity about equal to two 56S units. Their selection for the concrete plant at the anchorage was based on lower first cost and higher salvage value. The contractor feels that, at the conclusion of work on the second (Queens) anchorage, the mixers can be readily converted to truck use or can find reasonably quick sale on the used equipment market.

Top loading of the two Rex 5-yd. mixers installed in the plant required removal and replacement of the charging covers. Removal took about 6 sec. and replacement about 12 sec., a total of 18 sec. for the two operations. Sliding time for the aggregate and cement, dropped through a large revolving conical spout from the batchers above, was about 40 sec. Water, amounting to about 120 gal. per batch, was measured in a Rex metering tank and was discharged from a pipe into the conical spout simultaneously with the dry materials in about 30 sec. Discharge time for one of the 5-yd. mixers was about 50 sec.

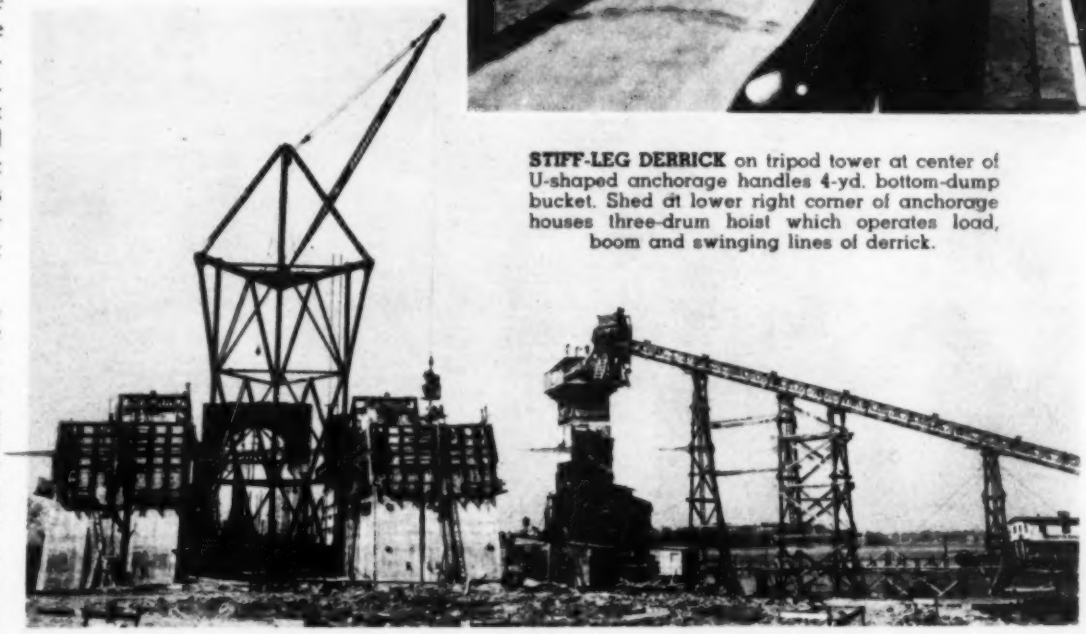
At the top of the mixing plant, about 70 ft. above the ground, the discharge end of the 650-ft. belt conveyor spilled aggregates into Heltzel steel bins below which were hung Heltzel weighing batchers equipped with Kron cumulative dial scales and a Bristol automatic weight-recording device which charted the cumulative weight and weighing time of each batch on a continuous sheet of graph paper. The chart showed the cumulative weight of each batch but did not show the individual weights of cement, sand and gravel unless the operator halted for a few seconds at the end of each step in the weighing operations to permit the moving graph paper to make a jog in the ink line under the stylus.

From the batch hoppers, which were large enough to hold the quantities for a 5-yd. batch, the dry materials dropped into a revolving conical spout which could be rotated into position to charge either of the 5-yd. mixers or to fill a back hopper from which the 4-yd. truck mixers drew their loads. Mixing water was turned into the conical spout while the dry materials were sliding into a mixer. Special flumes welded on to the sides of the funnel-shaped spout caught water discharged from a vertical pipe outlet no matter which mixer was being charged.

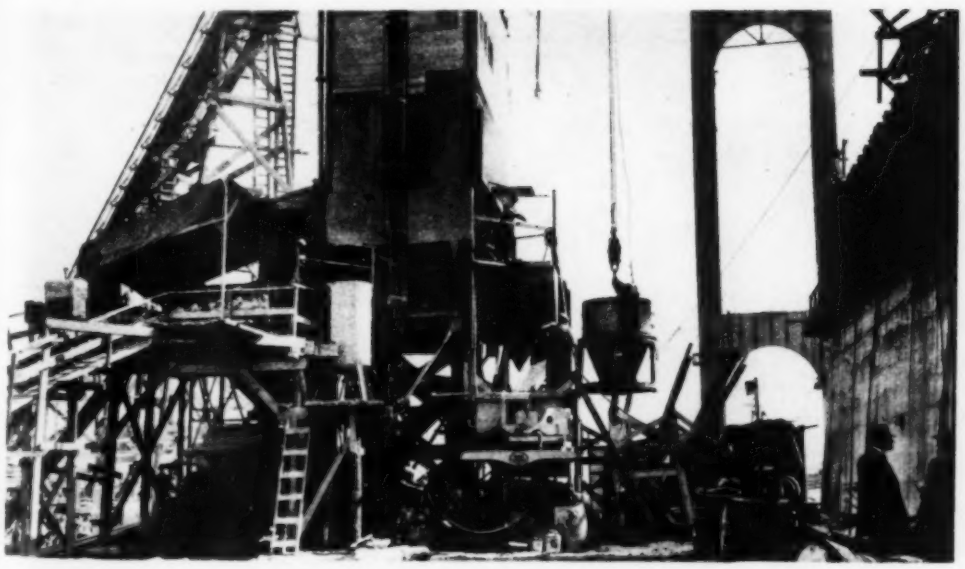
Mixed concrete was discharged by the two mixers into a steel hopper which fed either the 4-yd. bottom-dump bucket or the intake bin of the Rex double-chambered concrete pump.



**CONVEYOR BELT** 650 ft. long elevates sand and gravel to bins of mixing plant alongside bridge anchorage.



**STIFF-LEG DERRICK** on tripod tower at center of U-shaped anchorage handles 4-yd. bottom-dump bucket. Shed at lower right corner of anchorage houses three-drum hoist which operates load, boom and swinging lines of derrick.



**THREE METHODS** of distributing concrete **(left)** keep plant operating at close to maximum production. Batches mixed by two truck-type 5-yd. mixers discharge into steel bin which feeds either concrete bucket or double-chambered concrete pump. Truck mixer under platform at left draws 4-yd. dry batch from hopper on this side of plant.

Concrete was vibrated by two air-driven internal vibrators as it is placed in the anchorage forms.

*Material Supply*—A floating steam crane at the outshore end of the pier transferred sand and gravel by clam-shell bucket from barges to Blaw-Knox steel bins set up on the pier over the lower end of a Barber-Greene 24-in. belt conveyor, which was driven at the rate of 300 ft. per minute by a 40-hp. gasoline motor connected to drive pulley at the top of the concrete plant. This equipment for handling aggregates was easily capable of putting 250 cu.yd. an hour into the plant bins.

Bulk cement was delivered to the site by the New York Central Railroad in L.C.L. bottom-dump steel

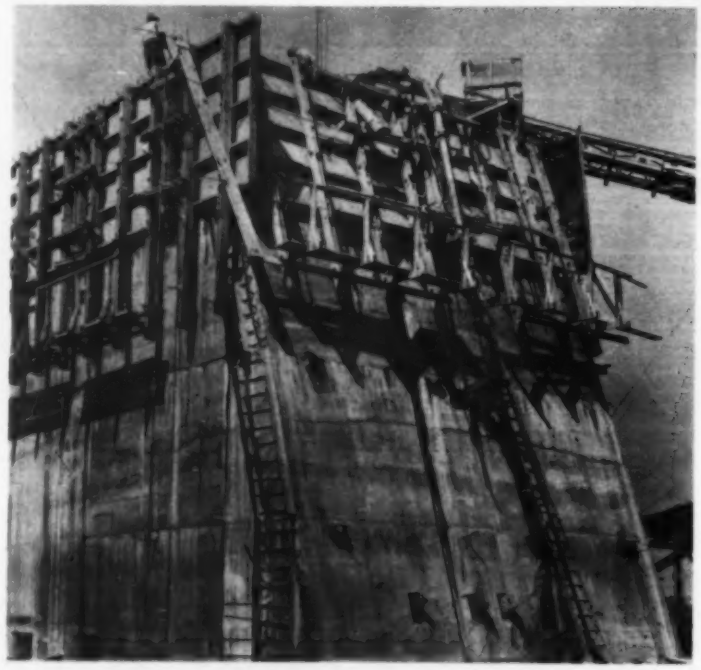
containers, holding 25 bbl. each, carried on steel scows. On a derrick lighter, belonging to the railroad company, the contractor set up a steel bin and a cylindrical steel tank for a Robinson air-activated cement conveying system. The derrick lifted the containers and dumped the cement into the steel bin, which was set up to discharge through an hermetically sealed canvas spout into the tank.

By the Robinson conveying system, compressed air was used first to aerate cement in the tank and then to transport the aerated material through an 865-ft. pipe line, including a 65-ft. vertical rise, to the bin at the top of the mixing plant. Successful operation for this length of conveying line was maintained with an air pressure range of 60 lb. to 20 lb. per square inch. The system ordinarily uses a 4-in. line up to distances of 1,500 ft., but on this job it operated with a 5-in. line because the contractor already had the larger pipe installed. An Ingersoll-Rand 415-c.f.m. compressor, driven by an oil engine, was mounted on the pier to supply air at 100-lb. pressure to operate the system, although a 360-c.f.m. compressor could have handled cement at the rate required. No after-cooler was required in the compressed air system. An air receiver was sufficient to eliminate condensation, and operation of the cement conveying system was so rapid that moisture had no chance to precipitate. Flexible hose connections were used between the pier and the lighter for both the air line and the cement line.

Air valves at the tank on this installation were operated by hand, although the system can be equipped with automatic air valves controlled by electric relays. The cement was ejected by the Robinson patented method. Essentially, the operation of the system consisted in dropping cement into the tank, opening the air inlet to build up pressure in the tank to 60 lb. (sufficient for an 865-ft. pipe line), while the discharge valve remained closed, and, finally, opening the discharge valve to transport the aerated cement after the pressure had reached 60 lb. Compressed air was allowed to flow into the tank during the transporting operation until the pressure dropped to 20 lb. The operator then closed the air supply valve and utilized the 20-lb. pressure remaining in the tank to clean out the main conveying line through a vent connection from the tank to the 5-in. pipe.

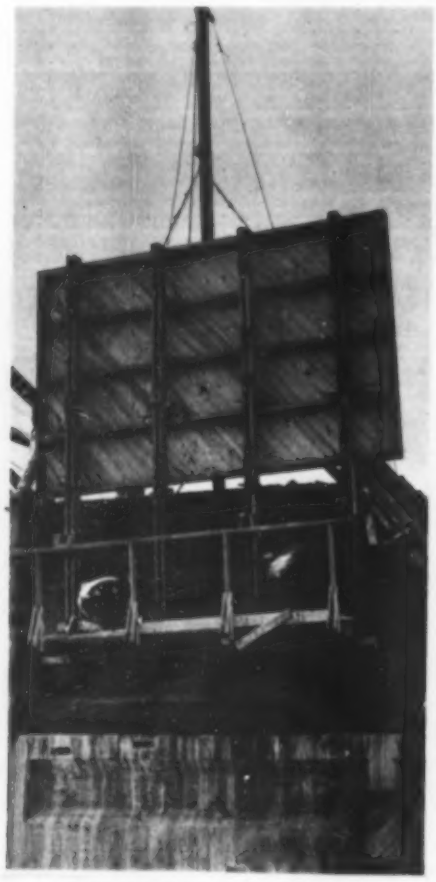
Steps in the procedure for a full operating cycle were as follows: (1) Close vent valve; (2) drop 20 bbl. of cement through air-controlled gate from bin into tank; (3) close air-controlled gate; (4) open valve on compressed air line at 100 lb. and build up tank pressure to 60 lb. in about 45 sec.; (5) open valve in conveying line and discharge 20 bbl.

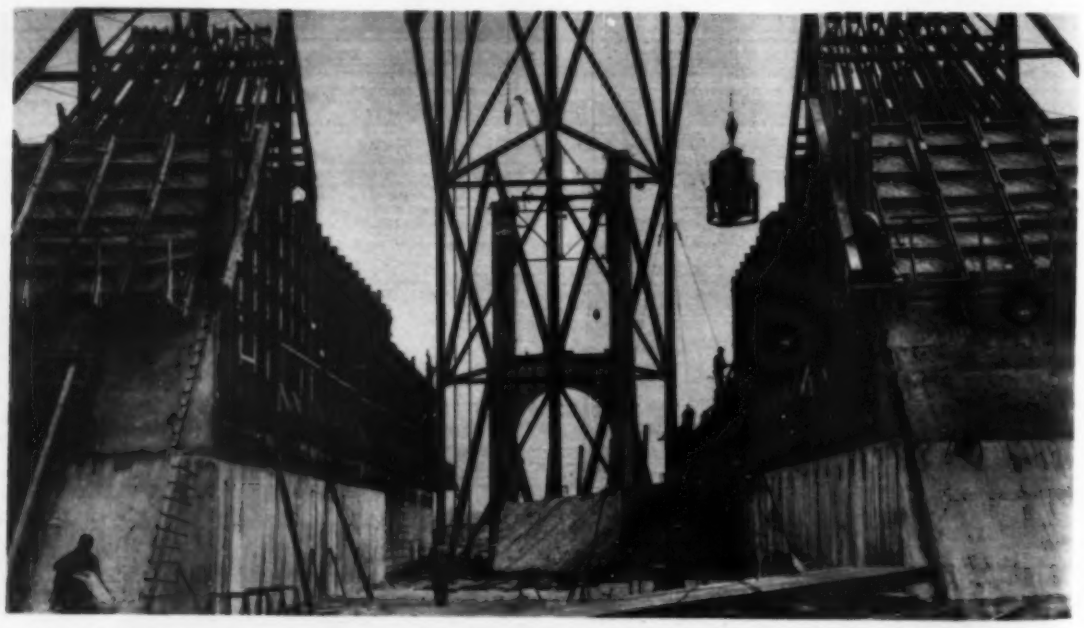
**LOUIS P. CORBETTA** (left) refuses to take any credit for his courage when E. WARREN BOWDEN (center), assistant to chief engineer, Port of New York Authority, and FRED C. WILCOX (right), president, Commercial Concrete Equipment Co., attempt to give him due praise for leaping fully clothed from lighter to save unconscious mechanic (weight, about 250 lb.) from death in tidal currents.



**WITH FORMS ANCHORED** in position by threaded rods through cantilever wales, 7-in. pipe line from concrete pump places 10-ft. lift of anchorage. Vertical riser of pipe line is tied down to timber cushion blocks to reduce surges.

**PANEL FORM (below),** for anchorage concrete has cantilever vertical wales, extending below panel, to anchor unit in position for next lift. Ginny-wink raises panel while carpenters on attached platform get ready to slip double wales over threaded anchor rods.

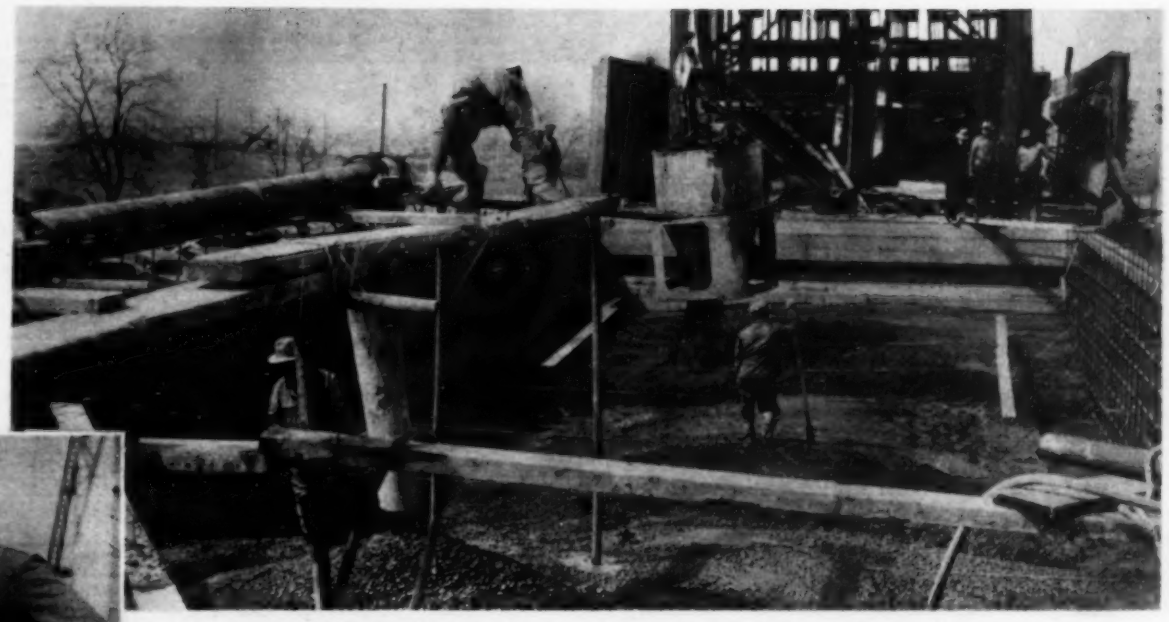




**AS FORMS MOVE UP** in successive lifts, bottom-gate bucket buries lower ends of eyebar anchor chains in concrete.

of cement in about 3 min., while tank pressure drops to 20 lb.; (6) close discharge valve and open vent from tank into conveying line. The cycle was repeated for each charge of cement.

Compressed air was admitted into the tank through a number of jet pipes which radiated from a manifold to discharge the air near the bottom of the cylinder. The cement was carried up into the conveying line through a suction hood 8 ft. long and 2 in. wide, which reduced gradually



**BUCKET AND PIPE LINE** place concrete simultaneously in anchorage block.

**LUNCH-WAGON SNACK.** LOUIS P. CORBETTA (left) munches a sandwich while N. S. BATEMAN, general superintendent, smiles at thought of what sandwich may contain.

**TWO 5-YD. TRUCK MIXERS (left),** served by single conical revolving spout are set up in tall plant structure to produce 30,000 cu.yd. of concrete.

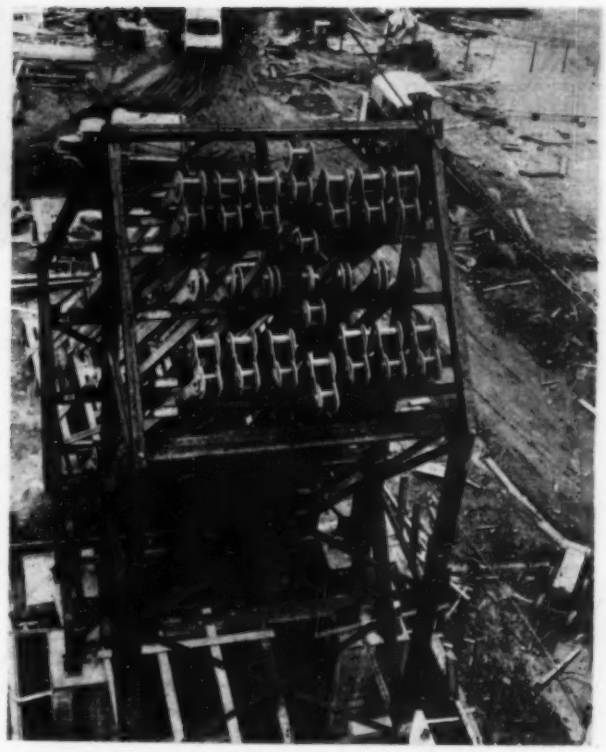
to a connection with the conveying pipe. The long rectangular opening of the suction hood was placed parallel with the bottom of the tank and just a few inches above it. After cement in the tank had been aerated at 60-lb. pressure, the rush of air when the discharge valve was opened carried the cement out of the tank and up into the suction hood. When the pressure in the tank had dropped to 20 lb., the vent connection was used to bypass the suction hood and deliver air directly from the top of the tank into the conveying line. The tank was designed to retain and permit removal of lumps that accumulated during transportation of cement to the job.

*Concrete Forms* — Anchorage concrete was placed in 10-ft. lifts inside movable forms made up in panel sections 10 ft. 6 in. high by 12 to 16 ft. long. The frame backing up each panel consisted of horizontal studs on 2½-ft. centers and double vertical wales on about 3-ft. centers. The wales extended about 8 ft. below the bottom of the form panel to provide cantilever support for aligning the form after it had been raised to position for a new lift. Threaded rods were cast in each lift of concrete to anchor the form panels on the succeeding lift. After serving as anchors, the threaded rods were screwed out of nuts buried in the concrete.

A portable A-frame derrick powered by an air hoist or by a hand winch raised the form panels from lift to lift. The form panels were designed for eighteen re-uses and were covered with ⅞-in. diagonal sheathing faced with ⅜-in. plywood lining, which could be renewed if necessary.

*Administration*—The Bronx-Whitestone bridge project is being built by the Triborough Bridge Authority, with Madigan-Hyland, consulting engineers, in charge of all construction. These consultants designed the parkway and service drive connections leading to and from the East River suspension bridge, which was designed by O. H. Ammann, chief engineer, Triborough Bridge Authority, and director of engineering, Port of New York Authority. H. W. Hudson is in charge of construction, representing Madigan-Hyland, assisted on the section here described by H. W. Knox, resident engineer.

For the Corbetta Construction Co. the work has been under Norman S. Bateman, general superintendent of construction, with Hal Hunt acting as field engineer. Roger Corbetta, manager of the company, and Louis P. Corbetta, secretary, have directed plant design and operation.



**ANCHORAGE EYEBARS (right),** to hold strands of parallel-wire cable are erected on steel frame in advance of concreting.

# HIGHBALL YOUR WAY TO *More* PROFIT WITH FASTER PO

**ODD JOBS DONE QUICKLY**—This K-O tractor and Baker bulldozer owned by Bailey & Bergonia, makes short work of filling in around a culvert on the "Lakes to Sea" highway near Phillipsburg, Pa. Ease of handling and quick pick-up makes the K-O an ideal bulldozing tractor. Put it to work keeping extra jobs abreast of the main work.

**SHIFT ON THE GO**—The Model S-O tractor shifts on the go like a truck—the time usually lost changing gears goes into profitable extra trips. Here Albert Bros., use an S-O and 7-yd. Continental to end dump over the edge of a fill on the Skyline Drive near Charlottesville, Va. Continental scrapers will speed your job by fast loading, by back-filling on slopes, against bridge abutments and over culverts where most scrapers cannot place dirt.

**COMPARE YOUR OUTPUT AND COSTS WITH FASTER POWER PERFORMANCE**

*For output check:*
- Starting Time
- Working Speeds
- Flexibility
- Ease of Handling
- Time Losses for Repairs

*For cost check:*
- Initial Cost
- Upkeep Cost
- Cost of Fuel per Gallon
- Cost of Lubricating Oil
- Working Life
- Trade-in Value

These factors determine your cost per yard. With A-C equipment operating costs will be low, operating speeds high

Keep your hauling roads smooth and fills level with a Speed Patrol, thus give hauling equipment a chance to move bigger loads faster and with fewer time-robbing gear changes. Then use outfits that can get up and travel—faster-moving Allis-Chalmers rigs. You get going more quickly because A-C engines start instantly and go right to work. As a result you gain from 1 to 3 payloads per shift with your tractor-scraper outfits *on starting time alone.* You travel faster and move more payloads every hour because A-C tractors have more and higher speeds—up to 6.41 m.p.h. or 100 feet in .177 minutes with Model L or L-O. Short turning, easy handling and quick pick-up save you trip-gaining seconds getting into and out of cuts, swinging about on narrow fills, maneuvering in tight spots. Pictures here show how others use A-C's FASTER POWER to keep their jobs rolling at a fast, profitable pace. You can do likewise.

***Ask your Allis-Chalmers dealer how you can highball your way to lower costs with FASTER POWER.***

**HIGHBALL HAULING** by using A-C Speed Patrols to keep your hauling roads smooth and fills level. Thus you enable trucks and tractors to travel at higher speeds with bigger loads and with fewer time-wasting gear changes. You eliminate rain-catching pockets and so decrease bogging down on haul and fill. Here Hall & Mitchell, widening U. S. 1 near Richmond, Va., use a Speed Patrol to keep blasted material off the road, thus speed both traffic and their own hauling.

**MOVE MORE BIG PAYLOADS**—You get heaping loads in the Gar Wood scraper, move those loads at speeds up to 6.41 m.p.h. with the L or L-O tractor. Here Frank Eblen, long-time A-C fleet user and one of the first users of Model L tractors, goes to town on a job near Atlantic, Iowa, with three L-O's, two L-12 Gar Wood scrapers and one L-10. He moves dirt cheaper with FASTER POWER, that's why he's a repeat user.

# ALLIS-CHALMERS

TRACTOR DIVISION—MILWAUKEE, U. S. A.

ENGINES AND CONTROLLED ROTATION OIL TRACK-TYPE TRACTORS FROM 32 TO 68 DRAWBAR H. P. . . . CRAWLER AND WHEEL DRIVE SPEED PATROLS . . . SCRAPER BLADE GRADERS . . INDUSTRIAL WHEEL TRACTORS . . STATIONARY POWER UNITS FROM 31 TO 162 BRAKE H. P. . . TWO, FOUR AND SIX-WHEEL SCRAPERS, BULLDOZERS, TRAILBUILDERS, LOADERS, MOWERS AND OTHER ALLIED EQUIPMENT.

**INCLINED TRUSS RIG** distributes concrete for bank lining on Los Angeles River flood control project in California, under direction of U. S. Engineer Department. Truss carries traveling bucket which is filled by paving mixer at top of slope and run out by cables to any desired point of discharge under 45-ft. long boom.

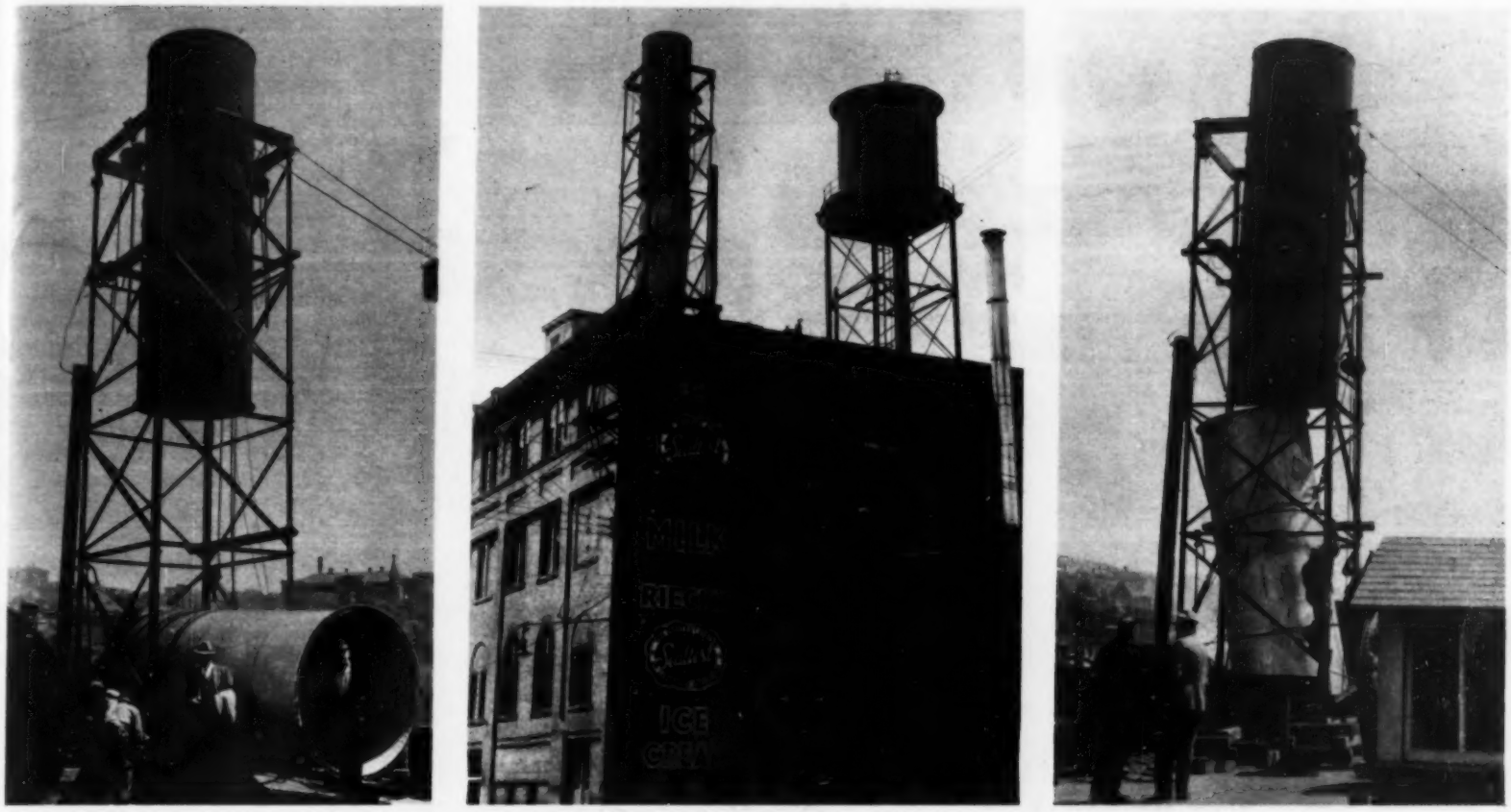
# How They Did It

## CONSTRUCTION DETAILS *For* *Superintendents and Foremen*

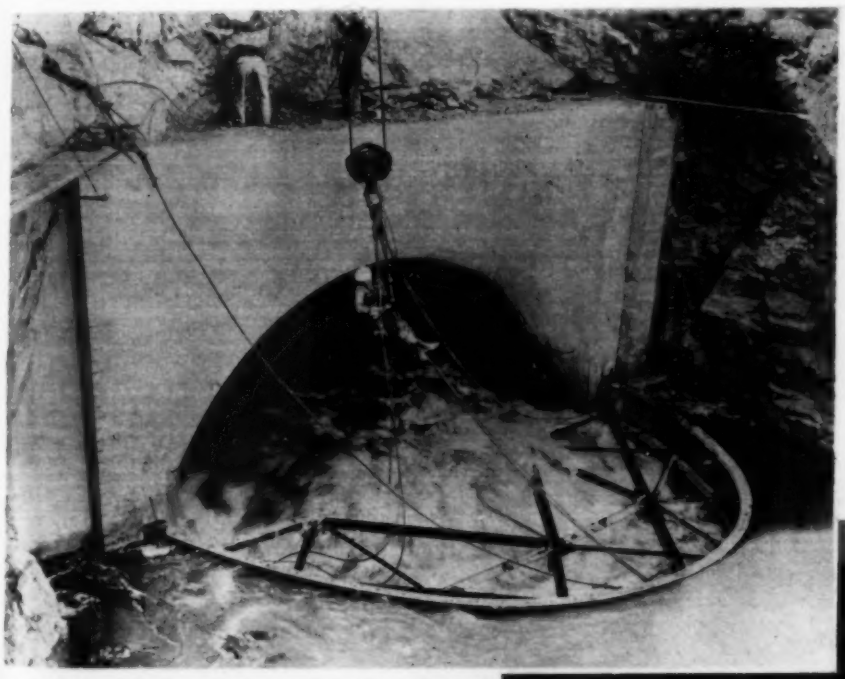
**SEMI-TRAILER DUMP BODY** on 3-4-ton International motor truck, with wheelbase of 137 in., increases yardage hauled by Crivello Trucking Co. of Milwaukee, Wis. Bath-tub type body is equipped with underbody hydraulic hoist.

**PLYWOOD PANELS.** held in place by trench braces, are used to sheet sewer trench for Bloom Township Sanitary District in Chicago Heights, Ill., for which C. H. Ashdown is resident engineer. Method developed by E. B. Dowd, construction engineer for WPA, utilizes standard concrete form panels of Douglas fir plywood ¾ in. thick, 4 ft. wide and 8 ft. long, with plywood cover plates over end joints between panels. Screw jacks bear against wood blocks at 8-ft. intervals to hold sheeting in place. Job records indicate savings of from 15 to 20 per cent with this method, using 2 sq.ft. of plywood per linear foot of sewer.

**AUTOMATIC TRAFFIC SIGNALS** (left) prevent accidents at intersection of two highways and interurban railway at Hales Corners, Wis. With train near intersection, traffic-actuated red signals are displayed on all four highway approaches, and green signals are shown after train passes intersection. Amber warning precedes red danger signal as train approaches.



**REPAIRS TO STACK** 6 ft. in diameter, by inserting new 20-ft. length below top section, were handled by the Eichleay Engineering Corp., of Pittsburgh, Pa., for Rieck-McJunkin Co., by methods illustrated above. Steel tower was first erected around stack on roof of building and top section held with two 2-ton chain blocks. Damaged intermediate section was cut out, and new section placed by removing a couple of angles to allow it to enter steel tower which acted as scaffold to support top section and as mast for boom which hoisted new section of stack to roof. The job took three days. — Photo from J. P. EICHLEAY, Eichleay Engineering Corp., Pittsburgh, Pa.



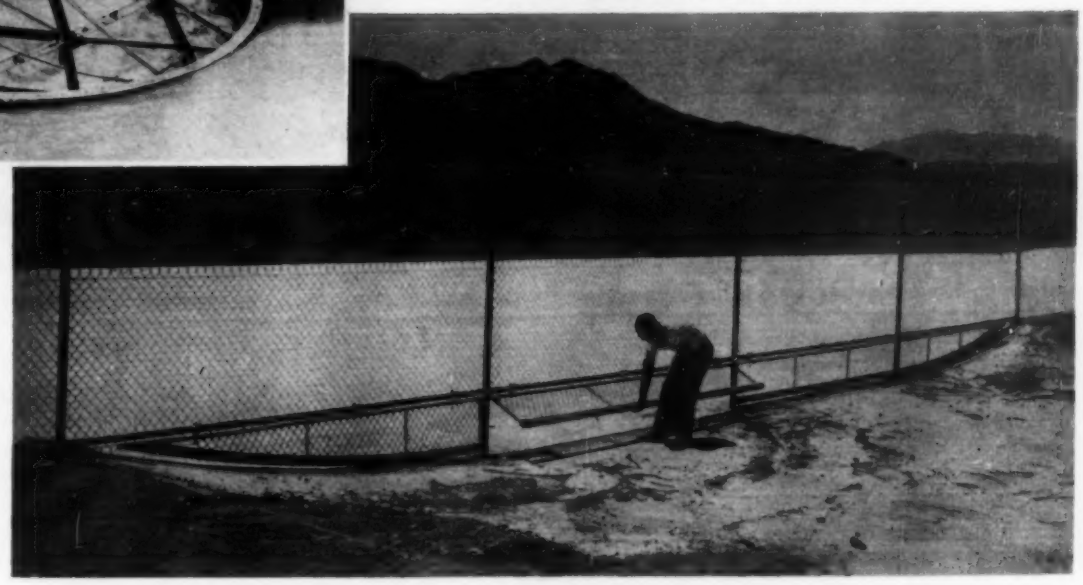
**STEEL TUNNEL FORMS** are put to unusual use when lowered by cable to shut off water at upstream portal of one of the diversion tunnels at Parker dam, being built by Six Companies Inc., for U. S. Bureau of Reclamation. Dam will divert flow of Colorado River into 242-mi. main line of aqueduct under construction by Metropolitan Water District of Southern California.

## WANTED — Photos of Details

The Editor of Construction Methods and Equipment wants photographs or sketches illustrating interesting DETAILS of method or equipment and will pay for those he finds acceptable for publication.

Hasn't your job produced some DETAIL that might be illustrated on this page? Send along a picture of it, we'll return it promptly if we can't use it.

**SWINGING GATES (below)** in 152 mi. of 6-ft. high fence which Metropolitan Water District has erected along open sections of Colorado River aqueduct in California allows debris to be washed out at crossing over canal spillway.



# COMPARATIVE COSTS OF OFFICE BUILDINGS OF FOUR HEIGHTS

By ARTHUR F. COMSTOCK

*Formerly Chief Estimator, James Stewart & Co., Inc., Contractor, New York, N. Y.*

OFFICE BUILDING CONSTRUCTION, although quite inactive during recent depression years, presents an interesting opportunity for study in building costs because of the extreme height to which such buildings have been erected. They represent our tallest structures, but not the largest in bulk or volume. The Merchandise Mart, for instance, in Chicago, contains 53 million cubic feet and is 27 stories high, while the Empire State Building in New York has 36 million cubic feet and is 85 stories high. The horizontal type building costs less per cubic foot to construct, but the high cost of real estate in our downtown areas has caused many of our buildings to be pushed up into the air rather than spread out over acres of ground.

Notwithstanding many features which most vertical office buildings have in common, such as story height, exterior wall thickness, steel frame, concrete floor systems, metal windows and doors, elevators, steel stairs, cement floors, hollow tile partitions, etc., there are still endless differences in foundations, ornamentation and architectural treatment, office layouts, special facilities required by different business organizations, and varying heights and shapes of buildings. Consequently, we have to deal with office buildings costing as low as 50c. per cubic foot and occasionally as high as $1.25 per cubic foot.

**HIGH LAND VALUES** push office buildings up in air instead of letting them spread out on ground. Efficient elevator installations make tall buildings practical.

### Four Buildings

This article deals with cost variations of vertical office buildings due principally to height and shape of building under New York conditions as of January 1, 1938. Four buildings A, B, C and D have been selected for comparison, 15, 30, 60 and 90 stories, respectively. Although they are not identical in architectural treatment and choice of finishing materials, they are nearly enough so as to make the costs fairly comparable from these standpoints. For instance, none of the buildings contains ultra-expensive materials or excessive ornamentation, and all can be considered as first-class and modern, with comparable facilities.

The accompanying table shows a comparison of the costs of each building per cubic foot, and by amount for each trade or item as usually broken down in a contractor's estimate. In the following comment the more important differences in cost are discussed.

Wrecking or demolition of structures existing on the site is usually a minor item, as in these four instances. However, with semi-modern buildings of reinforced concrete, or steel and concrete, there have been instances where wrecking cost several hundred thousand dollars.

In the item of foundations, including excavation, we deal with perhaps the most uncertain and variable item in building construction, and especially for vertical buildings with their heavy column loads. Every city — in fact, every part of every city — has its own foundation problems. In the case of Building A, where rock is close to the surface, we encounter a minimum cost. An intermediate result is found for B, where the building is carried on 50-ft. pipe piles, concrete filled. Buildings C and D required concrete caissons extending some 60 ft. or more to rock, with consequent foundation costs of over 6c. per cubic foot.

### Brickwork Costs

Brickwork is quite variable, depending, of course, upon the ratio of face brick to stone facing and also upon the tower dimensions and the relative cube of the tower compared with the base. The wall thickness is generally 13 in. Interior brick walls occur only at fire-tower. Common brick is used for back-up in all exterior walls and for fireproofing exterior columns.

Hollow tile is used for corridor, stair and elevator partitions and interior column covering. No office or sub-dividing partitions are included, but are built later as tenant changes. Buildings C and D have tile furring of exterior walls.

Finish carpentry in the four buildings is confined largely to stair handrails, as the use of wood in office buildings is highly restricted by the building code.

Floor arches in all four cases are short-span, cinder-concrete system with exposed beams about 7 ft. on centers. The slabs are 4 in. thick, mesh reinforced. For floor fill and finish 4½ in. are commonly allowed. Inasmuch as both floor arches and cement work are a function of floor area and are typical for most of the area, these items show great uniformity in cost per cubic foot. Good cinders are available in New York at reasonable cost, and it should be said that cinder-concrete arches are done here with remarkable efficiency.

### Steel Frame

Structural steel is generally the largest single cost item in a tall building. Many horizontal buildings, say 6 stories high, have been built with as little as 1.4 lb. of steel per cubic foot, using short-span arches. In the four vertical buildings presented, A has 1.8 lb. per cubic foot; B, 2.1 lb.; C, 3.2 lb.; and D, 3.7 lb.

Granite occurs in these buildings only as a polished base course of varying heights. Limestone is the principal exterior facing material for Buildings A and B, but is replaced

to a great extent by face brick for Buildings C and D. Union regulations in New York require that limestone be cut in the metropolitan district, resulting in a usual cost, set in place, of over $4 per cubic foot of stone, which exceeds costs outside of New York by some 70 per cent.

The principal item under ornamental and miscellaneous iron is steel stairs, and while the cost ratio is fairly constant on these particular buildings, this item of iron fluctuates considerably where ornamental features are introduced. Bronze, for the same reason, is an extremely variable item.

Hollow metal doors occur in all four buildings, as well as hollow metal base in office spaces. The elevator doors are steel, baked-enamel finish. In the typical office spaces the beams are exposed, but lobbies, corridors and toilet rooms have suspended ceilings.

Walls of lobbies and elevator lobbies are marble, as also are lobby floors. Corridor floors and base are terrazzo. Toilet room floors and wainscot are tile; toilet partitions are structural glass. It should be noted that marble in New York must be cut and fabricated in the New York district, according to union rules, so that it is more expensive here than elsewhere, and consequently is less used.

The pipe trades, while of great importance from a cost standpoint, actually aggregate at least 10 per cent less of the total cost than in some other types, particularly where ventilating or air conditioning are extensively used. Plumbing is fairly uniform in its cost ratio in the four buildings. Heating, using street steam in all four cases, is more variable. Electrical work also is somewhat variable, caused in part by different ratios in density of underfloor ducts. Recent increases in wage rates in these trades to $2 an hour will further increase their cost beyond the figures given here, and will further curtail building revival.

**Elevator Equipment**

Elevators run a close race with structural steel for cost supremacy in a vertical building, as is evident from the figures shown. Without the great advance in elevator machinery and control, vertical buildings could not have been developed to their present height. In many respects a vertical building is no better than its elevators.

Items 34 to 40, inclusive, have been discussed in a prior article (see *Construction Methods and Equipment*, April, 1938, pp. 36-39). Considerable divergence of practice obtains in treating these items, but on the whole they should represent a rather uniform percentage of the total.

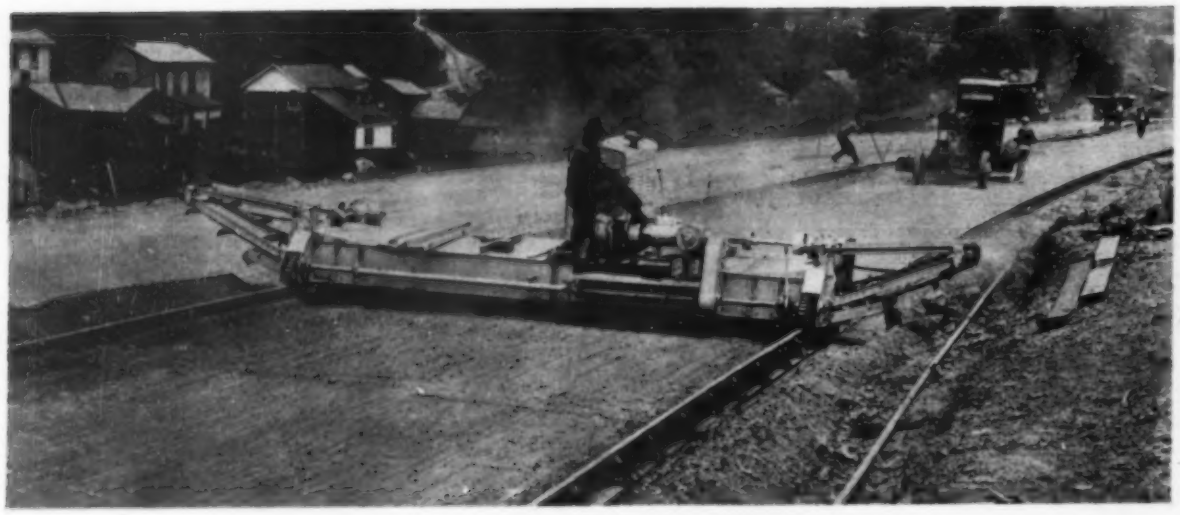
As for the total figures, varying from 55 to 83c. per cubic foot, the writer knows of other buildings of similar heights which for special reasons varied from the figures shown. But the purpose here is to show some of the causes of variation due chiefly to height, and there is certainly no claim advanced that other buildings will or should cost the same. Change is the law of construction and it is particularly applicable to building costs.

It might be said in closing that the writer uses a cost index of 95 for Jan. 1, 1938, taking the year 1926 as 100 under New York conditions. For adding the sub-dividing partitions and related work, ordinarily called "tenant changes," so as to make a completed office building, it is necessary to add from 7 to 12c. per cubic foot of building over and above the totals shown. None of these figures includes architects and engineers' fees nor carrying charges.

## Typical Tower-Type Office Buildings, New York City

SHOWING VARIATION IN COST, AS OF JAN. 1, 1938, DUE PRINCIPALLY TO HEIGHT AND SHAPE

| | A. *15 Story* | | B. *30 Story* | | C. *60 Story* | | D. *90 Story* | |
|---|---|---|---|---|---|---|---|---|
| Ground Area, Sq.Ft. | 150′ x 200′ = 30,000 | | 107′ x 70′ 1″ = 7,500 | | 139′ x 230′ 2″ = 32,000 | | 280′ x 200′ = 56,000 | |
| Gross Floor Area, Sq.Ft. | 500,000 | | 170,000 | | 960,000 | | 1,620,000 | |
| Cubage, Cu.Ft. | 6,000,000 | | 1,900,000 | | 12,000,000 | | 20,000,000 | |
| Tower begins at | 7th Floor | | 14th Floor | | 20th Floor | | 10th Floor | |
| *Sub-Divisions* | *Total* | *Per Cu.Ft.* | *Total* | *Per Cu.Ft.* | *Total* | *Per Cu.Ft.* | *Total* | *Per Cu.Ft.* |
| 1. Wrecking | $ 19,000 | $ .0032 | $ 4,500 | $0.0024 | $ 24,000 | $0.0020 | $ 78,000 | $0.0039 |
| 2. Excavation & Shoring | 85,000 | 0.142 | 14,000 | .0074 | 95,000 | .0079 | 170,000 | .0085 |
| 3. Piling (P) or Caissons (C) | —— | —— | (P) 45,000 | .0237 | (C) 580,000 | .0484 | (C) 940,000 | .0470 |
| 4. Concrete Foundations | 78,000 | .0130 | 23,000 | .0121 | 115,000 | .0096 | 250,000 | .0125 |
| 5. Brickwork | 125,000 | .0208 | 74,000 | .0389 | 590,000 | .0492 | 1,100,000 | .0550 |
| 6. Tile Partitions | 75,000 | .0125 | 26,000 | .0137 | 213,000 | .0178 | 380,000 | .0190 |
| 7. Rough Carpentry | 8,500 | .0014 | 11,000 | .0058 | 19,000 | .0016 | 36,000 | .0018 |
| 8. Finish Carpentry | 7,500 | .0013 | 3,400 | .0018 | 13,000 | .0011 | 22,000 | .0011 |
| 9. Floor Arches | 165,000 | .0275 | 50,000 | .0263 | 328,000 | .0274 | 580,000 | .0290 |
| 10. Cement Work | 85,000 | .0142 | 23,000 | .0121 | 132,000 | .0110 | 240,000 | .0120 |
| 11. Waterproofing & Dampproofing | 30,000 | .0050 | 6,400 | .0034 | 19,000 | .0016 | 52,000 | .0026 |
| 12. Caulking | 1,500 | .0003 | 300 | .0002 | 3,000 | .0002 | 5,000 | .0003 |
| 13. Structural Steel | 410,000 | .0683 | 155,000 | .0816 | 1,420,000 | .1183 | 2,925,000 | .1462 |
| 14. Granite | 25,000 | .0042 | 6,000 | .0032 | 39,000 | .0032 | 70,000 | .0035 |
| 15. Cut Limestone | 172,000 | .0287 | 98,000 | .0516 | 261,000 | .0217 | 360,000 | .0180 |
| 16. Ornamental & Misc. Iron | 38,000 | .0063 | 11,000 | .0058 | 68,000 | .0057 | 131,000 | .0066 |
| 17. Bronze Work | 85,000 | .0142 | 28,000 | .0148 | 270,000 | .0225 | 703,000 | .0352 |
| 18. Sheet Metal & Roofing | 26,000 | .0043 | 7,000 | .0037 | 53,000 | .0044 | 83,000 | .0041 |
| 19. Metal Windows, Doub. H'g | 45,000 | .0075 | 24,000 | .0127 | 125,000 | .0104 | 287,000 | .0143 |
| 20. Hollow Metal & Elev'r Doors | 60,000 | .0100 | 27,000 | .0142 | 177,000 | .0147 | 290,000 | .0145 |
| 21. Steel Partitions | 12,000 | .0020 | 6,000 | .0032 | —— | —— | —— | —— |
| 22. Plastering, Furring, Lathing | 158,000 | .0264 | 36,000 | .0190 | 350,000 | .0292 | 572,000 | .0286 |
| 23. Glass & Glazing | 17,000 | .0028 | 9,000 | .0047 | 33,000 | .0027 | 64,000 | .0032 |
| 24. Painting | 29,000 | .0048 | 12,000 | .0063 | 44,000 | .0037 | 100,000 | .0050 |
| 25. Finish Hardware | 17,000 | .0028 | 6,000 | .0032 | 21,000 | .0018 | 40,000 | .0020 |
| 26. Interior Marble & Struct'l Glass | 78,000 | .0130 | 29,000 | .0153 | 194,000 | .0162 | 444,000 | .0222 |
| 27. Terrazzo | 24,000 | .0038 | 4,000 | .0021 | 28,000 | .0023 | 65,000 | .0033 |
| 28. Ceramic Tile | 18,000 | .0030 | 10,000 | .0052 | 41,000 | .0034 | 90,000 | .0045 |
| 29. Mail Chute | 4,500 | .0008 | 3,400 | .0018 | 14,000 | .0012 | 26,000 | .0013 |
| 30. Plumbing & Drainage | 165,000 | .0275 | 59,000 | .0312 | 359,000 | .0298 | 630,000 | .0315 |
| 31. Heating & Ventilating (St. Steam) | 220,000 | .0367 | 52,000 | .0274 | 450,000 | .0375 | 920,000 | .0460 |
| 32. Electric Wiring & Fixtures | 270,000 | .0450 | 58,000 | .0305 | 500,000 | .0417 | 900,000 | .0450 |
| 33. Elevators | 351,000 | .0585 | 158,000 | .0831 | 1,330,000 | .1108 | 2,350,000 | .1175 |
| 34. Gen'l Conditions (Job Overh'd) | 115,000 | .0192 | 42,000 | .0221 | 293,000 | .0244 | 497,000 | .0248 |
| 35. Plant (Gen'l Contractors' Only) | 22,000 | .0037 | 8,000 | .0042 | 75,000 | .0062 | 125,000 | .0063 |
| 36. Insurance (General) | 20,000 | .0033 | 8,000 | .0042 | 55,000 | .0046 | 100,000 | .0050 |
| 37. Contingencies, 1-½% | 48,000 | .0080 | 16,000 | .0084 | 129,000 | .0108 | 225,000 | .0113 |
| 38. General Office Overhead | 96,000 | .0160 | 34,000 | .0180 | 270,000 | .0225 | 375,000 | .0187 |
| 39. Surety Bond Premium | —— | —— | —— | —— | —— | —— | —— | —— |
| 40. Fee (Commission-Profit) | 95,000 | .0158 | 47,000 | 0.0247 | 270,000 | 0.0225 | 375,000 | .0187 |
| Total* | $3,300,000 | $0.5500 | $1,234,000 | $0.6500 | $9,000,000 | $0.7500 | $16,600,000 | $0.8300 |
| *Not including Tenant Changes | | | | | | | | |
| Number of Basements | (2) | | (1) | | (2) | | (2) | |
| Pent House Stories | (3) | | (3) | | (3) | | (3) | |
| Exterior Treatment | Limestone | | Limestone | | Limestone and Face Brick | | Limestone and Face Brick | |



**MECHANICAL SURGRADER (left)** gives accurate finish to base of highway prior to pouring concrete for 20-ft. slab widths.

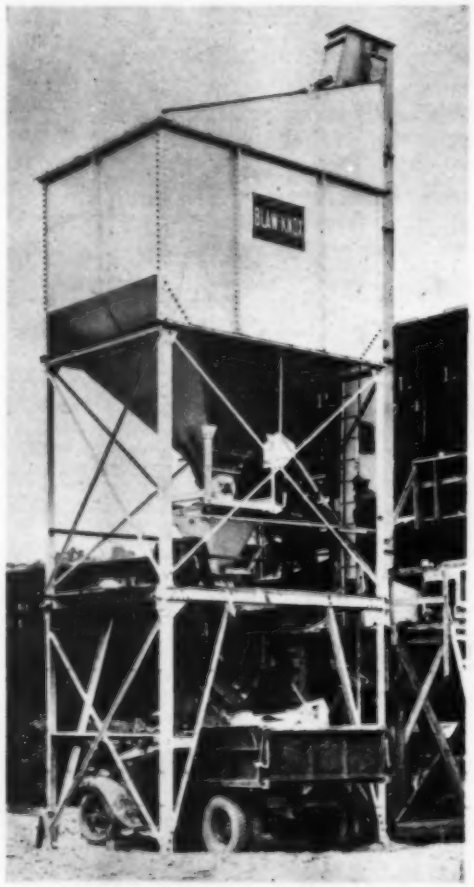
# Modern Equipment *Used on* *Divided Lane Highway*

A MODERN $1,000,000 traffic artery will further connect downtown Pittsburgh with one of the fastest growing suburban districts in western Pennsylvania. This is the new Banksville road which will permit two lanes of traffic in each direction, and provide an alternate route to and from the South Hills communities of Mt. Lebanon, Dormont, and Beechview, thereby lessening the rush hour traffic passing through the Liberty tubes tunnelled through Mt. Washington.

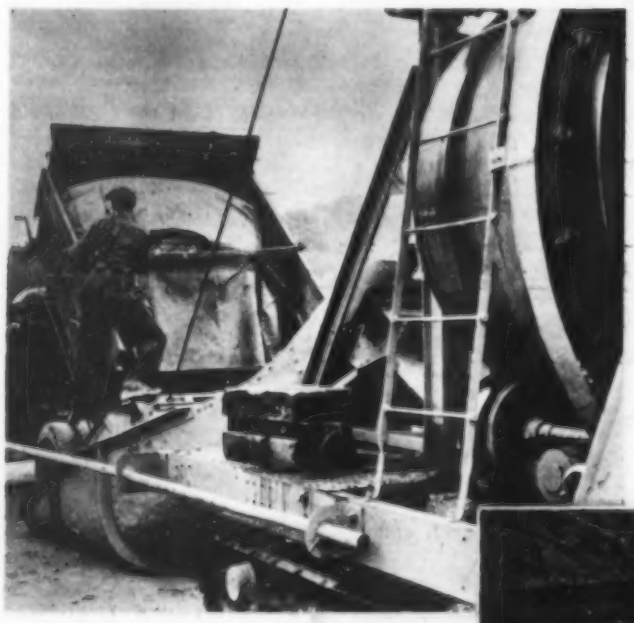
Booth & Flinn, Inc., local contractors, placed the 3 mi. of concrete pavement in two lanes, each 20 ft. wide and separated by a 4-ft. island strip. Construction problems resulted from the fact that the highway is being laid over an old single-track railroad bed along the route, and that an unusual amount of unsuitable base material was encountered, necessitating the hauling of quantities of clay or shale to the site.

After primary excavation, filling, and leveling, road forms were laid and a Flynn surgrader used to set the subgrade to accurate elevation and cross-section. A bulk cement batching plant having a 60-ton capacity, received bulk cement by the carload and batched it into trucks using the recently developed cement bags for hauling in batch-trucks. Crushed limestone aggregates were used and were batched and loaded into the trucks at a McCrady-Rodgers Co. plant. A fleet of about 20 two-batch trucks was used and hauled, on the average, 30 loads an hour. Batched cement and aggregates were discharged into a paving mixer, dumped between the forms, and leveled and surfaced by a gas-electric finishing machine.

Blaw-Knox equipment was used for preparing the subgrade, batching the concrete aggregates and bulk cement and for finishing the paved surface.



**BATCHING PLANT** for bulk cement is rated at 60-ton capacity and discharges by gravity to trucks.



**CANVAS BAGS** hold cement on top of aggregates in compartments of batch trucks.

**GAS-ELECTRIC FINISHING MACHINE (right)** brings concrete for pavement to proper grade and surface smoothness.

**OYSTER SHELL BASE** is laid in two courses. Bottom course is seen at right of truck dumping.

**FINISHED SHELL BASE** showing surface treated with application of bituminous material.

# *Florida Shell Roads* SURFACE-TREATED

DUVAL COUNTY, FLORIDA, in which the city of Jacksonville is located, has developed methods of building two-course, surface-treated oyster shell roads that give quite satisfactory service at nominal cost of construction and upkeep. About 125 mi. of such roads have been built by the county in recent years, most of the road surfacing done by the county being of this type, or sand-bituminous mixed-in-place work.

*Typical Project* — Specifications followed and methods employed by the Duval Engineering & Contracting Co. in building a 2-mi. section on what is known as the Ft. Caroline road are typical of the present policies of Duval County for this class of construction. They also follow closely the specifications and methods of the Florida State Highway department for this type of work.

Extensive use of oyster shell in parts of Florida is due to lack of local sources of good road stone in considerable areas of the populous parts of the state. Great deposits of shell occur along the Atlantic coast in some places where it is practical to dredge the material, screen, wash and load it with floating equipment. Deliveries by water are possible to the numerous coast cities and towns. Shipments also may be made as far as 30 to 40 mi. inland before limestone quarried in the north central part of the state becomes preferable on a cost basis.

Shell for the Ft. Caroline project was delivered directly from the dredging operations in motor trucks. Specifications required clean, sound shell free from signs of deterioration and worm holes. At least 80 per cent by weight had to be retained on a ½-in. screen, with not more than 15 per cent of the remainder fine enough to wash out in decanting.

Before any shell was placed on the finished subgrade 2-in. plank were set on both sides as forms. The first layer of shell was then dumped from the trucks to a depth of about 6 in. This layer was next rolled with a three-wheel 10-ton roller until thoroughly compacted to a depth of 4 in. As the shell was dumped and spread it was kept thoroughly saturated with water. While rolling was in progress the layer of shell was kept wet with a motor sprinkler. No dumping on or hauling over the subgrade was permitted. Trucks delivered the shell at the end of the previous spread. Each load was then distributed over the subgrade by hand with shovels.

Immediately prior to spreading a second course of shell the first course was thoroughly wet and well rolled. The first course was never laid more than a day's work ahead of placing the second course on it. The second course when loose was also about 6 in. deep. As soon as it was spread it was rolled wet until the entire base was firmly and solidly compacted to a total depth of 8 in.

Once the second course rolling was sufficient to get the desired results, the entire surface was scarified to a depth of 4 in. Then the material was accurately shaped with a tractor-drawn blade grader to the exact surface finish required. This final surfacing was done within not more than four days after the second course had been placed.

Rolling operations were handled so that not more than 60 sq.yd. of surface was compacted by each of two 10-ton rollers per hour worked. Under average conditions, from 2,000 to 2,500 sq.yd. of one course could be compacted in a 10-hr. day.

*Surface Treatment*—With definite, accurate specifications for materials, the priming and surface treatment of shell roads in Duval county are handled largely according to the weather. On the Ft. Caroline project the shell base was completed for the 2 mi. before the prime coat was applied. The application of the surface treatment then followed about ten days later.

J. A. Long is Duval County engineer in charge of highway construction and maintenance. George H. Hodges is president and Alexander Brest, secretary-treasurer of the Duval Engineering & Contracting Co.; J. S. Hagan, Jr., is superintendent of field operations for the contractor.

**SHAPING** of shell base, after rolling, is accomplished with tractor-hauled blade grader.

**FINAL ROLLING,** before surface treatment, is done with 10-ton three-wheel machine.

# *ANALYSIS OF HAULING CYCLE*
# Examines Factors Affecting
# *ROUND TRIP TIME*

**● Production of a hauling unit depends on two factors: hauling cycle and payload. The accompanying notes analyze and discuss the hauling cycle. They form the third unit in a group of articles, each complete in itself. The entire series presents a comprehensive study of hauling costs of pneumatic-tired automotive equipment on construction jobs and in open-pit mines and quarries. Information for the articles was obtained from 75 detailed field studies of hauling operations.**

By HORACE K. CHURCH

*Engineer, Euclid Road Machinery Co., Cleveland, Ohio*

THE HAULING CYCLE is composed of definite elements which deserve individual and collective study. As a basis for discussion, an accompanying table gives average hauling cycles for bottom-dump and rear-dump hauling units, based on about 35 detailed studies of level hauls under various conditions. In an additional tabulation appears a summary of the principal characteristics of an automotive hauling unit in their relationship to the elements of the hauling cycle.

*Loading Time* — The size and capacity of the hauling unit affect not only the cost of hauling but also the cost of loading. Common loaders of hauling equipment are shovels, draglines, cranes and elevating graders. Practice varies widely as regards the ratio of the size of hauling unit to the size of shovel or dragline, but many examples disclose that the hauling unit generally is four or five times the size of the loading unit. For example:

(1) 2-yd. rear-dump units universally serve ⅜- and ½-yd. shovels in numerous light excavation jobs.

(2) 7-yd. rear-dump units served 1¾-yd. draglines at the World's Fair site on Long Island.

(3) 11-yd. rear-dump units serve 2½-yd. shovels in the Pennsylvania anthracite coal strip mines.

(4) 20- and 24-yd. rear dump units served 4-yd. shovels at San Gabriel Dam, Calif.

(5) 7-yd. side-dump semi-trailer units serve a 1½-yd. shovel in the quarry of the Pennsylvania Sand-Glass Co. at Lewistown, Pa.

(6) 20-yd. bottom-dump semi-trailer units serve 4- and 5-yd. shovels in the bituminous coal strip mines of the Central States.

(7) 8½-yd bottom-dump semi-trailer units serve 2¼-yd. draglines on Mississippi River levees.

(8) As illustrated by the field study in the first article of this group, *Construction Methods & Equipment*, June, 1938, pp. 42-43, large side-dump units serve 2-yd. shovels in a copper mine, but the truck capacity is reduced to 7-yd. because of the heavy ore.

(9) 10-yd. bottom-dump semi-trailer units served a 2½-yd. shovel on the All-American Canal, Calif.

**REAR-DUMP UNITS** of 20- to 24-cu.yd. capacity serve 4-yd. shovels at San Gabriel dam.

In the case of elevating grader loading, practice does not follow any inflexible standard, as it is not uncommon to find hauling units from 2- to 12-yd. capacity under 42- and 48-in. elevating graders. Capacity should be such as to afford maximum grader production, unless this capacity and lowest hauling cost are not compatible. A 7-yd. water-level-measurement unit with a sideboard on one side to prevent spillage seems to be a practical size for maximum elevating grader production and efficient hauling unit operation in cut and on fill. Such a unit requires about ¾ min. for loading beneath a 48-in. elevating grader in average working conditions.

The area of the body top is quite important because the larger the area the easier the loading operation and the less the spillage of material. Shovel and dragline runners and elevating grader plow shakers rejoice at the sight of wide, long bodies. Accompanying photographs emphasize the importance of area of top of body when loading with a large dragline bucket and of low height when loading certain materials with an elevating grader.

Loading height should be as low as is consistent with the construction of the hauling unit. Elevating grader loading calls for a loading height consistent with the length of the carrier and the nature of the material to be transported up the inclined belt. Some free-flowing and chunky materials refuse to go up the carrier with above average inclination. A loading height of about 7 ft. seems to be the maximum consistent with average materials and loading conditions.

With respect to the effect of loading height upon loading time in the case of shovels and draglines, it is possible to be specific. In the ordinary operation of the loaders, hoist and swing operations are simultane-

**ON MISSISSIPPI LEVEE WORK** 2½-yd. draglines load 8½-yd. bottom-dump semi-trailer units.

**Characteristics of Automotive Unit Affecting Hauling Cycle**

| *Hauling Cycle Element* | *Hauling Unit Characteristics Affecting Hauling Cycle Element* |
|---|---|
| Loading | Capacity, area of body top, loading height and maneuverability. |
| Hauling | Average speed, dependent upon power, gear selectivity, traction and flotation. |
| Dumping | Hoist speed and dumping angle (if side- or rear-dump unit). |
| | Body construction and proportions (if bottom dump unit). |
| Turning at dump | Maneuverability and wheelbase. |
| Returning | Average speed, dependent upon power, gear selectivity, traction and flotation. |
| Turning at loader | Maneuverability and wheelbase. |
| Delay | If delay is attributable to hauling unit at loader or at dump, causes are generally associated with power, gear selectivity, traction, flotation and maneuverability. |

**Field Study of Turning vs. Shuttling**

| | *Turning Method* | *Shuttling Method* |
|---|---|---|
| **HAULING CYCLES** | | |
| Loading 4.5 yd. of pay load | 1.5 min. | 1.5 min. |
| Turning at shovel | .8 | |
| Hauling 450 ft. | 1.5 | |
| Hauling 450 ft. by backing | | 1.8 |
| Turning at fill | .7 | |
| Dumping load | .5 | .5 |
| Returning 450 ft. | 1.2 | 1.2 |
| Net round trip time | 6.2 min. | 5.0 |
| **PRODUCTION** | | |
| Loads hauled per "50-min. hour" | 8.1 lds. | 10.0 lds. |
| Pay yards hauled per load | 4.5 yd. | 4.5 yd. |
| Comparative productions per working hour | 36 yd. | 45 yd. |
| **COSTS** | | |
| Estimated hourly expense of ownership and operation | $3.50 | $3.50 |
| Comparative unit cost, cents per pay yard | 9.7¢ | 7.8¢ |

**LARGE BODY AREA.** 7 ft. wide by 15 ft. long, facilitates loading of 12-yd. (water-level) semi-trailer unit by 4-yd. dragline bucket at open phosphate rock pit excavated by walking dragline.

ous. However, on short swings of 60 deg. and less, the speed of the hoist rather than the speed of the swing sometimes affects the shovel cycle.

On Mississippi River levees, 2-yd. draglines usually load hauling units on a 20-sec. cycle. Hoist speeds are about 180 ft. per min. Accordingly, every foot of loading height adds about 1/3 sec. to the dragline cycle. It follows that if loading height is increased 1 ft., dragline production is reduced almost 2 per cent.

An average 2-yd. shovel also operates on a 20-sec. cycle on less than 90-deg. swings. The hoist speed is about 80 ft. per min. It follows that shovel production may be reduced by 7 per cent for every foot increase in loading height.

Because of the necessity for frequent quick movements under the loader, maneuverability of the hauling unit can affect loading time. Common examples are turning the hauling unit in the midst of a load at the end of an elevating grader cut and easing the hauling unit forward for the last few dippers from a shovel or dragline. Maneuverability in these cases is synonomous with power, gear selectivity, traction, and flotation, to be considered in a subsequent article.

*Hauling Time*—Hauling cycle summaries in the accompanying tabulation show that hauling time is 31 per cent of the gross round trip time. Travel speeds are given as average speeds, producing in this case a composite average speed of 7½ m.p.h. for average 1,950-ft. hauls, one way. Both bottom- and rear-dump units give average speeds which at first blush appear to clash with prevalent ideas of the travel speeds of rubber-tire automotive vehicles, although the two types of units are considered to be among the best performers in construction and industrial work. "Average speed" of modern hauling equipment is not flashy but conservative and substantial.

Average travel speed for hauling and returning on fifteen representative construction hauls, as given in the table, is but 10 m.p.h. The hauls ranged from 600 to 12,400 ft., one way, and averaged 2,300 ft., one way. These values for the bottom-dump semi-trailer type units represent excellent performances over level haul roads in average fair condition.

One of the fastest long hauls observed by the writer was in connection with the building of the All American Canal near Yuma, Ariz. The haul road was 2.35 mi. long

**LEAVING PIT.** coal-hauling unit **(below)** travels for 1,700 ft. over typical mine road at average speed of 10 m.p.h.

**BOTTOM-DUMP SEMI-TRAILER UNIT** is loaded with about 15 tons of coal by power shovel operating in strip mine.

**ON LEVEL HAUL ROAD,** excellently ballasted and maintained, loaded units average 23 m.p.h. and reach maximum of 27 m.p.h. Returning empty on this road they average 32 m.p.h. and make maximum speed of 35 m.p.h.

**Average Hauling Cycles for Pneumatic-Tired Automotive Units**

| | *Bottom-Dump Unit* | | *Rear-Dump Unit* | |
|---|---|---|---|---|
| **GENERAL DATA** | | | | |
| Average capacity, loose measurement | 9 cu.yd. | | 8 cu.yd. | |
| Average length of haul | 2,300 ft., one way | | 1,600 ft., one way | |
| Average material hauled | Earth mixtures | | Earth-rock mixture | |
| **HAULING CYCLE** | *Minutes* | *Per Cent* | *Minutes* | *Per Cent* |
| Loading | 1.8 | 18 | 1.9 | 19 |
| Hauling, average 8½ m.p.h. average 6½ m.p.h. | 3.1 | 33 | 2.8 | 29 |
| Dumping | .2 | 2 | .4 | 4 |
| Turning at dumping point | .5 | 5 | .5 | 5 |
| Returning, average 11½ m.p.h. average 8¼ m.p.h. | 2.3 | 24 | 2.2 | 22 |
| Turning at loading point | .4 | 4 | .5 | 5 |
| Net round trip time | 8.3 | 86 | 8.3 | 84 |
| Average delay | 1.3 | 14 | 1.6 | 16 |
| Gross round trip time | 9.6 | 100 | 9.9 | 100 |

**LOW BODY HEIGHT** is important in all kinds of loading but particularly in handling certain classes of material with elevating graders.

**WELL MAINTAINED ROAD** 1,200 ft. long of average 1 per cent downgrade permits average hauling speed of 12 m.p.h. and average returning speed of 11 m.p.h. at Cajalco dam, Calif.

and in excellent condition. Bottom-dump semi-trailer-type units carrying loose load of about 11 yd. maintained an average travel speed loaded of 16 m.p.h. with maximum of 21 m.p..h. and average travel speed light of 17 m.p.h. with maximum of 23 m.p.h.

In industrial haulage of bituminous coal in the Central States strip mines, bottom-dump semi-trailer units reach high consistent average travel speeds. Accompanying illustrations show a typical operation. The hauling units carry about 15 tons of coal per load. Traveling out of the pit for a distance of 1,700 ft. from the loader to a level haul road, the hauling units make an average speed of 10 m.p.h. Rolling over 3,200 ft. of level, excellently maintained, ballasted haul road, they make an average speed of 23 m.p.h. and a maximum of 27 m.p.h. Average speed for the total distance of 4,900 ft., loaded, is 15 m.p.h.

Returning 4,700 ft. from the tipple to the end of a level haul road, the empty units show an average speed of 32 m.p.h., with a maximum of 35 m.p.h. On 1,200 ft. of inclined ramp and in the pit, the average speed is 10 m.p.h. Average speed for total return distance of 5,900 ft., light, is 22 m.p.h. For the entire round-trip distance of 10,800 ft. (2.04 mi.), the travel speed averages 19 m.p.h., with a maximum of 35 m.p.h.

Average travel speed for rear-dump units as obtained from the eighteen studies summarized in the accompanying tabulation is only 7½ m.p.h. Hauls ranged from 400 to 7,600 ft., one way, and averaged 1,600 ft., one way. Accompanying photographs and captions citing exemplary average travel speeds show that well maintained haul roads are necessary for good speeds and, naturally, for reasonable maintenance costs. In general, it has been observed that haul roads in the eleven far western states are in better shape than elsewhere and that, correspondingly, hauling unit travel speeds are higher. Excellent climatic conditions and generally good management are chiefly responsible.

**TYPICAL EFFICIENT HAULING OPERATION,** on Colorado highway job, uses rear-dump units traveling 600 ft., one way, down gentle grade of average roughness. Average speeds are 4 m.p.h. loaded and 7 m.p.h. returning light.

Perhaps the fastest average speeds for hauling units in construction work is in the carrying of batches in connection with paving and surfacing. A few years ago the writer studied batch hauling in various parts of the country; a few examples of hauling speeds are selected from the data then obtained:

(1) In 1930 in the State of Washington, trucks of three-batch 6-ton capacity averaged 15 m.p.h. hauling and returning over a 3-mi. comparatively rough grade.

(2) In 1929 in Michigan trucks of three-batch 6-ton capacity averaged 11 m.p.h. hauling and returning over a 4-mi. comparatively rough grade.

(3) In 1930 in California trucks of 6-ton batch capacity averaged 26 m.p.h. hauling and returning over a 4-mi. paved highway.

(4) In 1929 in Michigan, trucks of 6-ton batch capacity averaged 18 m.p.h. hauling and returning over an 18-mi. gravel county highway.

(5) In 1928 in Massachusetts, trucks of 3-ton batch capacity averaged 16 m.p.h. hauling and returning over a combination paved highway and grade of 2-mi. length.

All the foregoing information indicates that "average speed" which controls hauling time has little or no relationship to the speed as generally set forth in the specifications. Its relationship is with the power, gear selectivity, traction, and flotation of the hauling unit. As already mentioned, these features of the hauling unit will be discussed in a later article.

*Dumping Time* — Three types of dump bodies are in general use — side, rear, and bottom dump. Rear- and bottom-dump bodies are more popular than the side-dump type, and discerning users have assigned each of the two types to its proper

**UNUSUAL SIDE-DUMP SEMI-TRAILER UNIT (left)** hauling from quarry shovel is dumped at primary crusher by electric overhead crane.

**ON 4,500-FT. ROAD** of average 1 per cent upgrade **(above),** good roadway maintenance enables 10-yd. rear-dump units to average 12 m.p.h. loaded and 14 m.p.h. returning light on All American Canal construction, California.

**THREE-AXLE UNIT** of large capacity with load on back at San Gabriel dam has turning circle diameter of about 100 ft., as indicated by wheel track.

**SHORT TURNING DIAMETER** of 50 ft. for this two-axle unit eliminates disadvantage and danger of having to reverse on hairpin turns of 10 per cent upgrade haul.

sphere. The rear-dump body is used for handling bulky, hard, and variable materials, such as quarry and open-pit products, rock excavation and combined rock and earth excavation. Bottom-dump bodies are used for handling free-flowing materials such as sand, gravel, clay, decomposed shale, earth and coal.

Whenever possible, it is economical to use the bottom-dump type of body for the fundamental reason that it is cheaper to get rid of a load by dropping it than by lifting it. Side- and rear-dump bodies require expensive hoisting devices, whereas bottom-dump bodies require only an efficient device for closing the doors after the load has been dropped.

Conditions on each job determine the proper type of body. It is well to bear in mind that efficient rear- and side-dumping action calls for well built hoists of generous diameter and correspondingly low pressure (with ample pump capacity) and for high dumping angles of 75 deg., if possible. Similarly, efficient bottom-dumping action calls for trouble-free door-closing devices and generous, unobstructed door openings. As indicated by the accompanying tabulation of hauling cycles, a saving of 2 per cent in gross round-trip time is possible by the use of bottom-dump units as against rear- or side-dump units.

*Turning at Dump* — The importance of short turning radius at the dumping point and at the loading point is manifest. Single or double reversals to make a turn can easily add 5 or 10 per cent to the round trip time, thereby reducing production and increasing unit cost in the same proportion.

Semi-trailer units (with or without individual driving wheel steering brakes) can make the shortest turns. Turning circle diameters of 30 ft. are common. A two-axle-type unit with "load on back" turns in a circle of about 60-ft. diameter, although some units can turn in 50 ft.

Greater turning circle diameter is required by the three-axle-type truck with "load on back." An accompanying photograph shows a unit of this type being used on an operation where turning circle diameter was sacrificed in order to get large capacity — San Gabriel Dam, Calif. Three-axle units on this job have a turning circle diameter of about 100 ft., as indicated by the wheel tracks in the photograph.

A handy rule of thumb is that "Turning circle diameter equals about five times the wheelbase of the unit,

(*Continued on page 62*)

**RETURNING SPEED** is less than hauling speed at Ralston Creek dam, where haul of 4,500 ft., one way, starts in borrow pit on upper level and ends atop dam works below. Haul includes 1,300 ft. of steep (average 12 per cent downgrade) switchback ramp.

**GENTLE DOWNGRADE HAUL ROAD** 1,500 ft. long permits units to reach top speed of 18 m.p.h.

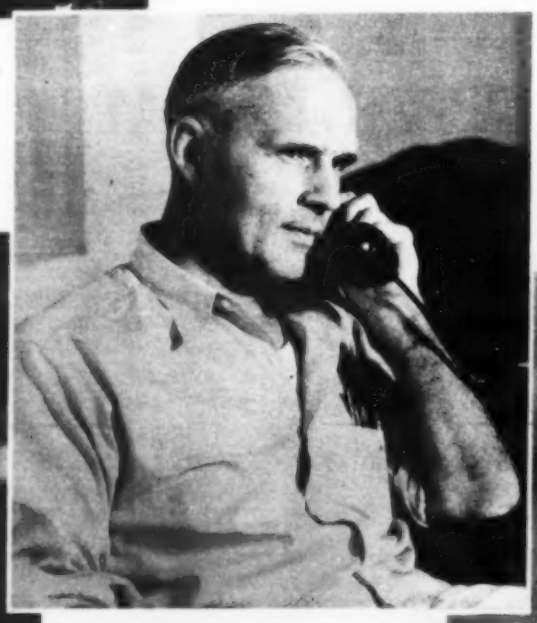
**TORTUOUS SWITCHBACK CURVE** slows loaded units on 12 per cent downgrade ramp.

# *Present and Accounted For~*

## *A Page of* PERSONALITIES

**AQUEDUCT AND DAM BUILDERS** form distinguished group at Lawrence adit of San Jacinto tunnel, important link in Metropolitan Water District's Colorado River aqueduct in Southern California. **(Left to right):** B. C. LEADBETTER, general superintendent for San Jacinto tunnel; GILBERT J. SHEA, general manager, J. F. Shea Co., contractor; JOHN AUSTIN, superintendent at Lawrence adit; JULIAN HINDS, assistant chief engineer, Metropolitan Water District; FRANK CROWE, general superintendent for J. F. Shea Co. on Parker dam (recently named general superintendent for Pacific Constructors, Inc., on $36,000,000 Shasta dam); and THADDEUS MERRIMAN, consulting engineer, Board of Water Supply, City of New York.

**A. C. DENNIS** (left), hardrock tunnel veteran and general superintendent for the Dravo Corp., of Pittsburgh, Pa., confers with ANDREW ADAMS, shaft superintendent, regarding progress of work on the company's Delaware River aqueduct project for New York City's additional water supply.



**PROJECT ENGINEER (left)** on Tennessee Valley Authority's Gilbertsville dam is GEORGE P. JESSUP, recently promoted from construction superintendent on the TVA's Wheeler and Guntersville dams. Mr. Jessup's record includes more than 25 years of experience as superintendent of construction for Stone & Webster Engineering Corp., of Boston, Mass.

**NEW PRESIDENT** of New England Road Builders' Association is E. RAYMOND NEWELL, of R. H. Newell Co., contractors and engineers, of Uxbridge, Mass.

**CHIEF CONSTRUCTION ENGINEER, (right)** with duties including all Tennessee Valley Authority dam construction projects, is A. L. PAULS, recently advanced from the position of project engineer on TVA's Pickwick Landing dam, now substantially completed. In 25 years of experience on heavy construction Mr. Pauls' work has included flood control dams with the Miami Conservancy District of Ohio, irrigation dams with the U. S. Bureau of Reclamation, and hydro-electric projects for several public utilities.

# Business Methods Applied to HOUSE BUILDING

*(Continued from page 40)*

designed by G. E. engineers. Return air grilles are located in the floors. To avoid accidents, floor grill openings are not cut out until the carpenters are ready to lay the oak finish flooring.

To save drafting room work, the builders make no preliminary pipe diagrams. The plumber uses a plan showing location of fixtures only, and he works from these locations, avoiding cutting of lumber.

For the sake of variety and individuality in the houses, the builders specify different colors and patterns for stucco and brick veneer exteriors as well as for interior decoration. Color specifications for each house are issued to the contractors concerned: painter, plasterer, stucco and brick mason, plumber, tile setter.

*Foundations* — Footings of basement walls are 1:3:5 concrete mixed and placed fairly dry. Footings are 12 in. deep and vary in width depending upon the soil; minimum width is 24 in. A mopping of heavy asphaltic damp-proof paint is applied to the outside of all basement walls, except where water is encountered in the soil; in the latter case a built-up water-proofing of hot asphalt and two layers of 24-lb. felt is used. Cellar floors are concrete 4 in. thick poured monolithically.

*Lumber and Roofing* — Framing of all houses is No. 1 Douglas fir; roof and side wall sheathing is 7/8-in. North Carolina yellow pine; sub-flooring is square-edged fir, and surface flooring is 7/8-in. oak. The roof is covered with No. 1 Bangor, Pa., slate, laid on 24-lb. felt and fastened with copper nails. Gutters, leaders and flashing are 16-oz. copper.

For interior millwork, the builders use almost entirely No. 1 white pine. Outside doors are 1¾-in. white pine, and interior doors are 1¾-in. fir. Exterior hardware is solid brass or hammered iron, depending on the architectural style, which also governs choice of inside hardware.

*Tile and Painting* — Bathrooms have tile floors and tile walls to a minimum height of 4 ft. In the kitchens, the walls are painted but are fitted with tile drainboards and back-splash. The kitchen floor is covered with standard-gage linoleum.

Interior woodwork is given three coats of paint, finishing with semi-gloss enamel. Hardwood floors are scraped and filled and are given three coats of shellac or varnish (clear or stain), depending upon the wishes of the purchaser. Walls and ceilings are colored by adding color to the Keene's cement plaster finish coat of a three-coat plaster job, reinforced in the corners with metal lath and corner beads.

*Miscellaneous Details* — Hot and cold water pipes are red brass (85 per cent copper) and hot water tanks are Monel metal. All windows have steel sash and plate glass and are fitted with full-size bronze screens and Venetian blinds. The kitchen is equipped with a modern gas range and mechanical refrigerator.

A gas-fired furnace heats conditioned air for warming the house in winter. Fans in the system can be used to circulate air in the summer. The lawn surrounding each house is seeded and is completely landscaped with an abundance of shrubs. An average lot is about 8,500 sq.ft., with the minimum set at 7,500 sq.ft.

*Service to Owners* — After houses have been occupied, the builders continue to give reasonable service to the buyers of the property, thus creating additional good will. Home owners in the community are among the builders' best sales agents. Services to a new home owner may include such details as fixing stuck doors, pointing up white cement tile joints around tubs, and replacing leaking washers.

*Organization* — As in any business enterprise, the success of the organization is proportionate to the intelligence and energy of the personnel. Operations are carried out under the general management of William J. Levitt, president of the firm. The entire process of construction, from design to completion of houses and other structures, comes under the direction of Alfred S. Levitt, in charge of construction and design. Acting under him are C. A. Monroe, chief engineer, heading a department composed of five professional engineers; Edwin V. Ludlow, chief superintendent of construction, in charge of building the houses; Anthony Baker, assistant construction superintendent, in complete charge of work at a separate development on Long Island; and Oliver Marron and Clinton Hepburn, designers who confer with purchasers and settle final details of houses. Abraham Levitt is in full charge of all landscaping for the community and for individual houses, including landscapes designs, buying and planting.

**FOR PAINTING WET SURFACES** of metals, especially iron and steel, and of other non-water-absorbing materials, new water-exhaling paint can be applied without preliminary wiping. Paint contains absorbing ingredient which combines with water and forces itself to top of paintfilm, where it evaporates, leaving non-water-reversing, waterproof, rustproof coat claimed not to peel, blister or crack. Can be used also on freshly dried plaster, concrete, brick, wallboard, wood and linoleum; on mildewed and moldy materials; on surfaces exposed to heat, steam or fumes of bituminous and ammonia compounds. Protects surface against 4 per cent caustic soda and, according to manufacturer, affords some fire-protection and insulating value. — **Wet-X-Hale Paint Compound Co., 15 Moore St., New York, N. Y.**

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Address
City State


# ANALYSIS OF HAULING CYCLE

*(Continued from page 59)*

the basic factor being tractor wheel-base in the case of a semi-trailer and overall wheelbase in the case of a three-axle load-on-back unit."

Hand in hand with turning radius is that abstract quality known as maneuverability, which embraces such important features as driver's visibility when backing, ease of steering and convenience of all controls. It is highly important in all elements of the hauling cycle but is impossible to evaluate.

*Returning Time* — Returning time usually is not much faster than hauling time, as is disclosed in the hauling cycles of the accompanying table, where hauling and returning speeds are 8½ and 11½ m.p.h. for bottom-dump units and 6½ and 8¼ m.p.h. for rear-dump units. In some operations, when the haul is downgrade, the returning speed may be less than the hauling speed.

This condition obtains on the Ralston Creek dam project near Denver. The entire loaded haul of 4,500 ft. consists of 1,200 ft. in the borrow pit, 1,500 ft. of gentle downgrade haul road, 1,300 ft. of steep average 12 per cent downgrade switchback ramp, and 500 ft. atop dam work. Hauling units carrying 14 cu.yd. loose measurement averaged 11.6 m.p.h. loaded and 10.2 m.p.h. empty. When traveling loaded down the 1,500 ft. of gentle downgrade haul road, the unit reached top speed of 18 m.p.h. The lower return speed is explained by the high altitude and the excessive grades on the return trip.

During the returning part of the hauling cycle, power, gear selectivity, traction, and flotation again are of prime importance, especially when return grades are uphill, when altitudes are high, and when traveling conditions are bad.

*Turning Time at Loader* — A discussion of this element of the hauling cycle is similar to that of turning time at the dump. In connection with turning time, it is well to emphasize the desirability of high-speed reverse gearing for units carrying load on back, particularly in highway building which involves frequent opening of new cuts.

An accompanying table summarizes the hauling cycles, productions, and costs obtained on a job by (1) turning in the conventional manner at shovel and dump and (2) shuttling without turning. The job, in the Blue Ridge Mountains of Virginia, involved opening a new cut in mixed earth and rock excavation. The haul was about 450 ft., one way, with downgrade of about 5 per cent.

Shuttling afforded a saving of approximately 2 c. per pay yard in this instance. Of course, high-speed reverse gearing is not necessary for shuttling, particularly in less than 500-ft. haul work. However, the availability of such gearing extends the limit of economical shuttling.

If shuttling is contemplated and if a unit is selected with high-speed reverse gearing, careful consideration should be given also to maneuverability features such as driver's vision to rear and convenience of all controls.

*Time for Delays* — According to the summaries, delays to hauling units average 15 per cent of the gross round trip time or total available time. There is little that can be done to cut down this time loss because it usually is caused by something beyond control — minor delays at the loading unit, "bunching" of hauling units and minor difficulties at the dump or fill.

It is generally conceded that about 17 per cent of the total available hauling unit time should be allowed for miscellaneous minor delays. Accordingly, estimators generally use the so-called "50-min. hour" in the preparation of production data. After estimating the net round trip time of the hauling unit with no allowance for delays, the estimator divides this time into 50-min. to obtain the estimated loads hauled per working hour. That the practice is sound is proved by innumerable studies of all kinds of hauling equipment by the writer.

❀

**ANOTHER ARTICLE by Horace K. Church, to appear in an early issue, will discuss power, gear selectivity, traction and flotation of the automotive hauling unit and will present a performance chart correlating horsepower, gross load, total unit resistance and travel speed for a wide range of hauling conditions.**

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**PROTECTION COURSE FOR WATERPROOFING** and for use under wood block flooring, called Traffic Top, has many uses in construction field. As protection course it is said to permit speedy and economical erection and to allow backfill to be placed immediately. Under wood block flooring it cushions traffic shocks, reduces noise in factories, offices, railroad stations and other similar structures.

Also may be used as promenade or traffic surface for flat roofs, playgrounds and basement floors. Because Traffic Top is treated against destruction by termites and dry rot and because asphalt gives it added protection against moisture, this product is well adapted for use in damp basements. Available in thicknesses of ¼ and ½ in. and in boards 2x4 ft. Used for roof coverings it may be cut in attractive designs and painted in pleasing colors. — **Celotex Corp., 919 S. Michigan Ave., Chicago, Ill.**

# CONSTRUCTION EQUIPMENT NEWS

(ALL RIGHTS RESERVED)

## *Review of Construction Machinery and Materials for* SEPTEMBER, 1938

**MOBILE STABLIZER PLANT** for mixing clay soils, aggregates, calcium chloride, salt, etc., used in the construction of roads, consists of a pneumatic-tired main truck unit on which are mounted the various processing units. Cedar Rapids plant is designed for feeding with clamshell bucket and is equipped with large receiving hoppers above both the aggregate and clay-soil feeders. Aggregate passes in predeter-

mined quantities through feeder to pugmill. Clay soil is fed by mechanical screws to short belt conveyor leading to disintegrating crusher whence it is discharged to pugmill. There is a separate feeder for calcium chloride or salt. Mixing is done in long, single-shaft pugmill which can be raised or lowered from horizontal operating plane as required to obtain the best mix. Finished mix is discharged on to delivery conveyor designed either for direct truck loading or delivery to storage loading hopper or bin. The plant is operated from one power unit, either gas or diesel, at the option of the purchaser. Outstanding features claimed for the new plant are: Non-clogging clay-soil feeder; accurate proportioning devices; low operating height; self-contained, mobile unit; large capacity at low operating cost.—**Iowa Manufacturing Co., Cedar Rapids, Ia.**

**TRAILER VILLAGE,** designed for construction crews and survey parties in isolated regions, provides living accommodations of self-sustaining community. In photograph above, group of separate units, in front row, includes, at left, trailer equipped as dormitory to sleep 8 men; in center, another dormitory trailer, sleeping 6 men; trailer at right serves as office during daytime and as quarters for 4 men at

night. Trailer in middle row has shower baths, basins and toilet facilities. In back row unit at left is kitchen, with quarters for 2 men, while trailer at right is mess hall; at meal times the latter two trailers are brought together as combination kitchen and mess hall. Trailer village has central electric light system from utility trailer and central heating system with rubber hose connections from bottled gas. Trailers are designed for backing up to each other to form two or more rooms. Units can be combined in shape of "H" or "C", if desired. Standard models include body lengths of 17, 19 and 22 ft., welded steel chassis, quick-detachable coupler and electric-brakes. Weights range from 2,450 to 3,430 lb.—**The Covered Wagon Co., Mount Clemens, Mich.**


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*Are easy and Economical to Handle*

● Slow, costly "kid glove" handling methods, involving intricate rigs and slings, are out when you use Union Metal Fluted Steel Shells for cast-in-place concrete piling. Their light weight makes for easy unloading and handling, yet the hardest knocks won't faze them. That's because they are fabricated by the cold rolling process which permits the use of lighter gauge metal without sacrifice of strength.

By the same token, Union Metal Pile Shells drive faster. Their reduced weight combined with the fact that they are strong enough to be driven without core or mandrel means less inertia for the hammer to overcome.

Every engineer and contractor should have the facts concerning this modern, money-saving method of pile construction. Write for catalog now!

THE UNION METAL MANUFACTURING CO.
CANTON, OHIO

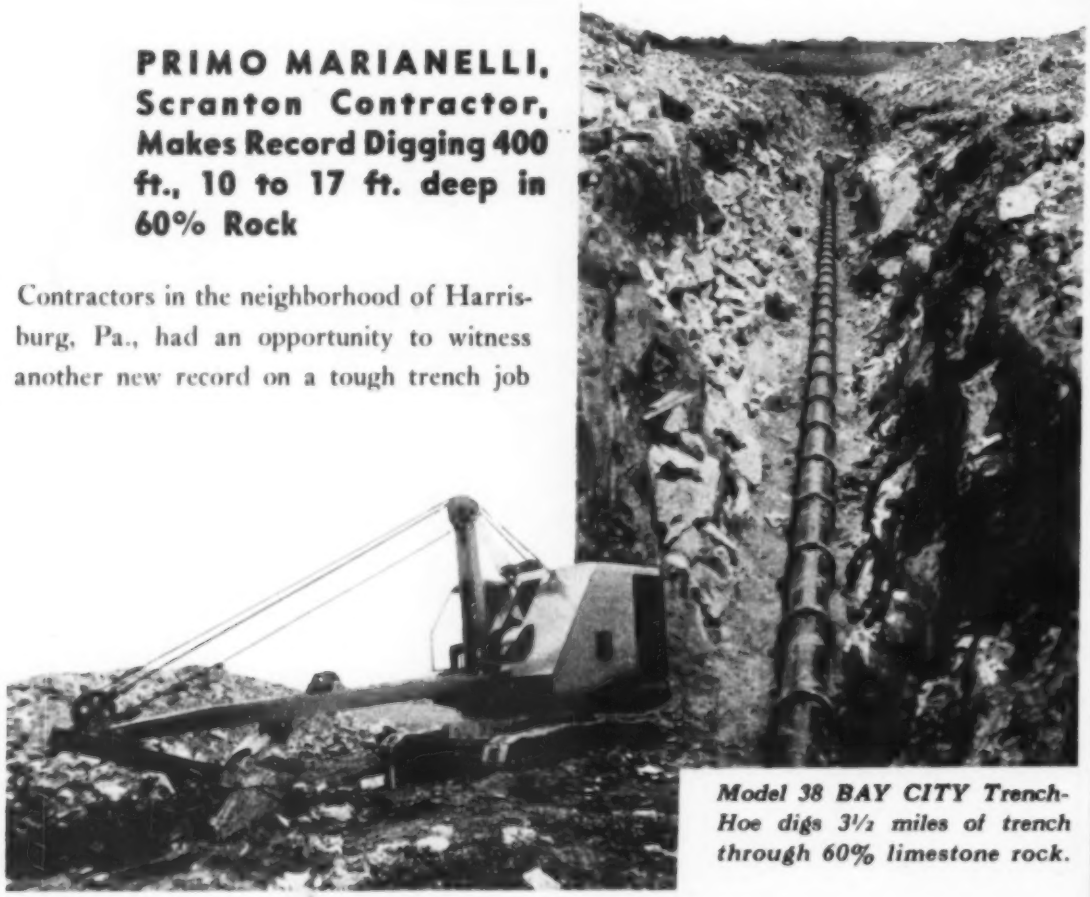
*These light but sturdy Union Metal Pile Shells are being loaded onto truck by hand.*

# How The Other Fellow Did It — *by Dig'n Digger*

*a review of records made by contractors*

## PRIMO MARIANELLI, Scranton Contractor, Makes Record Digging 400 ft., 10 to 17 ft. deep in 60% Rock

Contractors in the neighborhood of Harrisburg, Pa., had an opportunity to witness another new record on a tough trench job when Primo Marianelli, Scranton contractor, put in 3½ miles of drainage pipe for the new Pennsylvania Industrial School for Boys at White Hill.



*Model 38 BAY CITY Trench-Hoe digs 3½ miles of trench through 60% limestone rock.*

The project consists of digging trenches 10 to 17 feet deep for laying 6" to 24" terra cotta pipe. Difficult digging was encountered almost the whole length of the job where excavation ran about 60% limestone rock that had to be shot. No easy job for the most experienced contractor, yet Mr. Marianelli and his crew made a record in moving 400 feet of rock and earth per shift of 16 hours.

No amount of "gingerbread" gadgets on your excavator will ever get yardage like this in heavy trench work or any other work. No Sir, it takes weight and power — *weight for stability* to win where others fail and *power to produce* when the going gets tough. If you figure that yardage at low cost provides the final payoff, you will find BAY CITY machines will out-produce and out-perform because engineering design permits wider working ranges and safer crane loads.

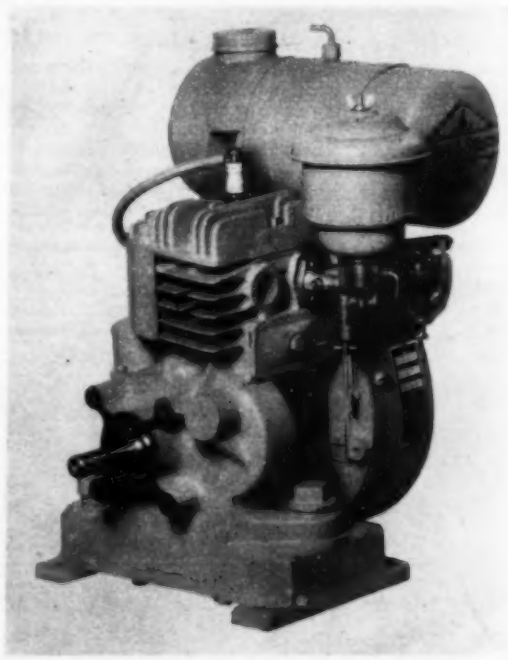
Primo Marianelli used his BAY CITY Model 38 Trench-Hoe in making this record. You too can put this kind of performance on your next job and reduce cost of excavation. There is a dealer near by who will, without obligation, show you a BAY CITY in action and explain why they are big yardage producers, or write to BAY CITY SHOVELS, INC., Bay City, Mich., for new "Compare" booklet.

"Advertisement"

**GEAR AND WHEEL PULLER.** 4- and 12-ton capacities, for maintenance, repair and replacement work on all kinds of machinery consists of three double-end chains having a grab hook on one end for

attaching to spoked wheels and a special close-grip hook on the other end for engaging solid gears. Chains fit into forks of a three-armed yoke, and a screw bar is threaded through the yoke. Point of screw bar fits against end of shaft, and pulling power is accomplished by applying a wrench on the square end of the screw bar. Flexible design permits use of spoked, solid, webbed or any type or size of gear or wheel; close to or far from end of shaft. One size puller handles most every-day pulling jobs. — **Edelbute Manufacturing Co., Reynoldsville, Pa.**

**FOUR-CYCLE AIR-COOLED GASOLINE MOTOR** provides actual horsepower over recommended operating range of 0.93 at 2,600 r.p.m., 1.00 at 3,000 r.p.m., and 0.98 at 3,200 r.p.m. Piston displacement, 4.71 cu.in. with 2x1½-in. bore and stroke. Ignition supplied by specially designed dust and moisture-



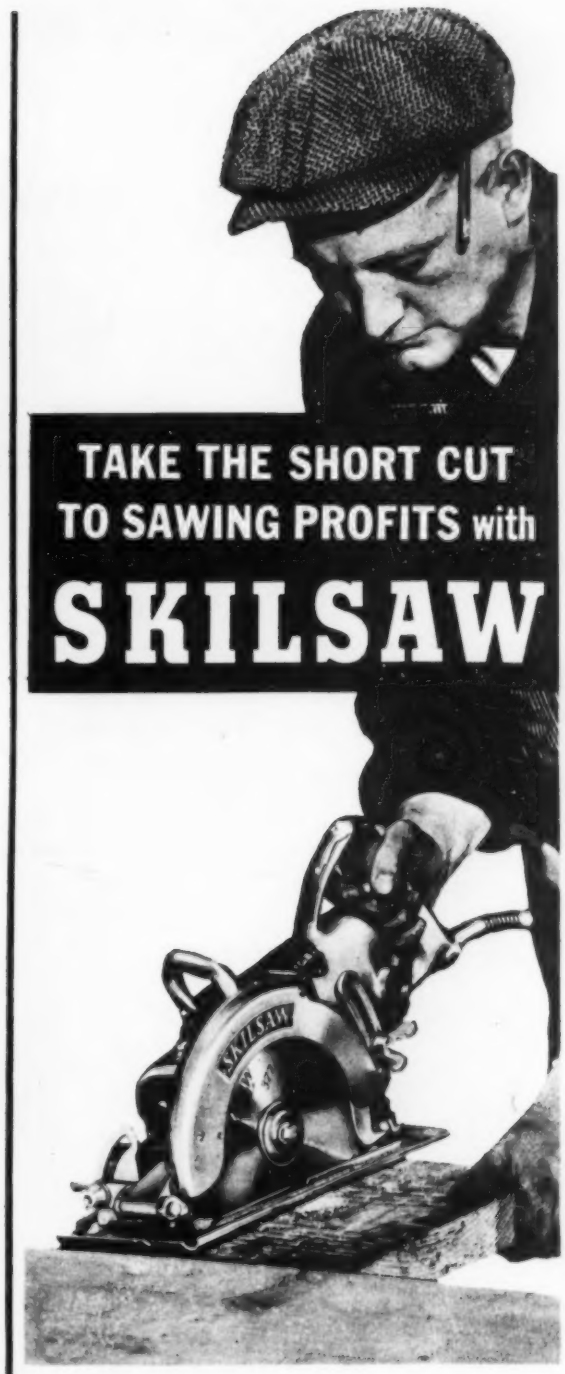
proof high tension flywheel magneto. Other standard equipment: Silchrome exhaust valve with alloy steel inserted seat; molybdenum alloy valve guides; aluminum alloy cylinder head; adjustable pneumatic governor; drop-forged crankshaft with ball-bearing and oil seal; specially designed float feed carburetor, gasoline filter, oil-bath air cleaner, screened blower case, and crankcase drilled and tapped for direct mounting of equipment. Fuel tank capacity, ½ gal.; oil reservoir, 1½ pt. Overall dimensions: height, 14 in.; width, 10½ in.; depth 11 in.; net weight, 38 lb. — **Briggs & Stratton Corp., Milwaukee, Wis.**

**HIGHWAY CONCRETE VIBRATOR.** for attachment to any type of finishing machine, may be had in two sizes — single unit which vibrates pavements up to 12 ft. in width and double unit for pavements up to 20 ft. in width. Adjustable for vibrating crown and straight pavements. Powered by 3-hp. gasoline engine equipped with automatic clutch and high speed countershaft. Power is trans-

mitted to concrete paving vibrator tool by heavy-duty flexible shafting. Features: (1) Highway slab surface finished with one pass of equipment; (2) two vibratory elements furnish double energy to compact concrete; (3) vibration is placed evenly along forms without pushing concrete over edges; (4) vibrating tubes lifted vertically out of concrete, permitting thorough vibration near expansion joints. Said to reduce finishing time with least initial investment and lowest maintenance cost. — **Mall Tool Co., 7740 S. Chicago Ave., Chicago, Ill.**

**LIGHTWEIGHT, VERSATILE WAGON DRILL.** built for continuous, heavy-duty operations, features ratchet by which one man can quickly raise or lower drill guide on upright. Air-motor, controlled-pressure automatic, positive feed provides range of feed pressures from 1 to 1,000 lb. Worm gear, which transmits power from air motor to feed chain is self-locking, eliminating all thrust and shock to motor, preventing drill from dropping or jumping forward. Uses same fast and powerful drills as the larger wagon drills and will accommodate 6-ft. steel change. 20-ft. steels easily handled. — **Ingersoll-Rand Co., Phillipsburg, N. J.**

**HYDRAULIC SCRAPERS** combine two new features said to increase efficiency of equipment by insuring quicker and easier loading, hauling and dumping: (1) Cutting edge of pan is held at flat digging angle which permits earth to pass rapidly to rear of pan, thus loading it naturally from rear to front, requiring less power and time. (2) Automatic clearance for hauling and dumping is provided for by installation of powerful springs at rear of pan. When loading, these springs are automatically compressed, lowering pan into digging position. When loading is completed, springs are released, thus raising pan for hauling and spreading — **Baker Mfg. Co., Springfield, Ill.**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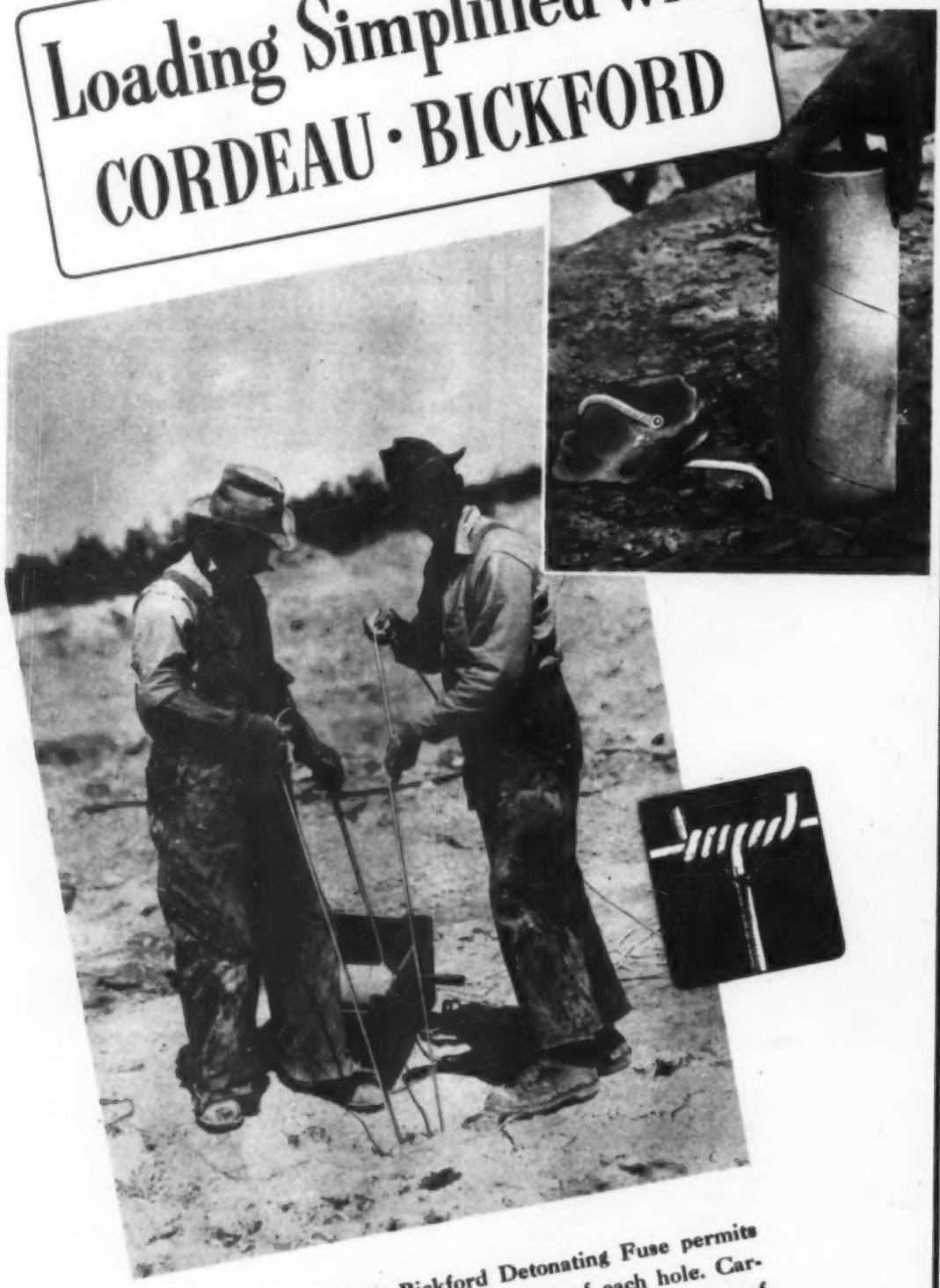
# Loading Simplified with CORDEAU·BICKFORD



. . . . because Cordeau-Bickford Detonating Fuse permits quicker loading, tamping and stemming of each hole. Cartridges may be slipped down alongside the taut line of Cordeau, which remains in direct contact with the whole charge and detonates it at the proper time with the greatest effectiveness.

**THE ENSIGN-BICKFORD COMPANY • Simsbury, Conn.**

CB76

CORDEAU·BICKFORD *Detonating Fuse*


**DETACHABLE TRUCK BUCKET,** known as the "Load-Lugger" is recommended by its makers for work on quarries — transferring stone from quarry to crusher — and for hauling concrete aggregates, brick and tile; for low cost material handling at mines; for sewer excavation on busy and narrow

streets; for hauling and transferring any material loaded by hand. Advantages: (1) No counterweight required; (2) direct drive from power take-off to hydraulic pump hoist assembly — requires no high pressure hose connections; (3) no cables or sheaves requiring replacement: (4) carried on truck itself, rather than by suspension; (5) guides on bottom prevent side sway; (6) dumps instantly. Hoist — rotary, vane-type, hydraulic; boom construction — 6-in. channels with white oak centers; sub-frame — 6-in. channels, welded construction; buckets — one-piece, reinforced with angles; controls — one-man from driver's seat except attaching and detaching buckets. Capacities, 1, 1¼, 1½ and 2 cu.yd. — **Brooks Equipment & Mfg. Co., Knoxville, Tenn.**

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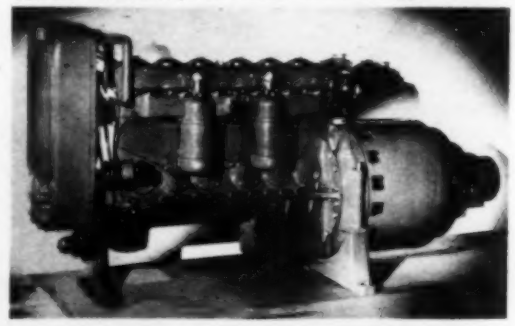
**DIESEL GENERATOR SET** offered in two sizes: 4-cylinder engine delivering 45-55 kw. and a 6-cylinder model delivering 65-85 kw. Either a.c. or d.c. current available, and units can be supplied com-



plete with generator built into flywheel housing or separate and driven through a flexible coupling. Engine is full diesel employing solid injection. Starts on gasoline, handwheel control permitting switch over to diesel fuel. Filtered fuel supplied at low pressures to injectors which care for metering. Alloy metal insulating cap on piston head shields body of piston from heat, reducing danger of sticking rings. — **Murphy Diesel Co., Ltd., Milwaukee, Wis.**

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**SMOOTH BORE HOSE** of patented "Spiralock" construction and designed either for suction or discharge service, is said to make possible hose light in weight and flexible for easy handling, yet sufficiently durable to withstand hard service. Capable

of handling pressures up to 30 lb. per square inch. Locking of fabric around spiral wire insert anchors wire securely in place and in case hose is crushed, makes an easy matter of pounding wire back into position without serious damage. Available in sizes ranging from 1½ to 4 in. and at present limited to 20-ft. lengths with straight or enlarged ends. Ends may be altered to fit special couplings. — **B. F. Goodrich Co., Akron, Ohio.**

# BLAW-KNOX

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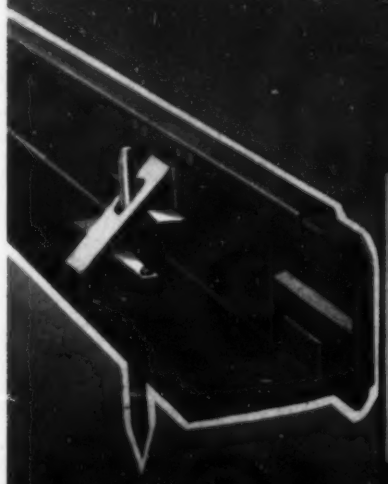

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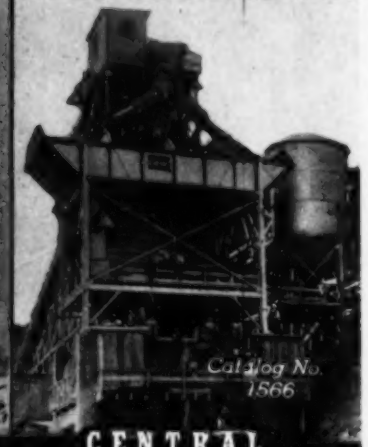

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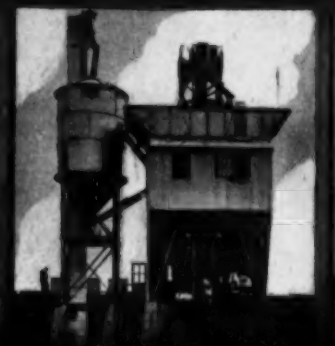

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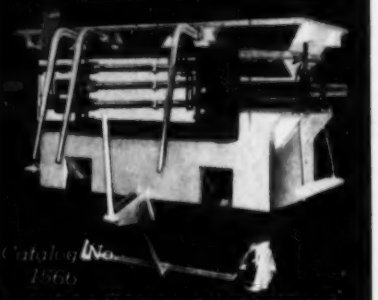

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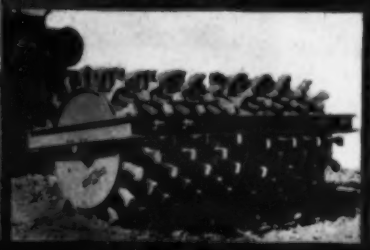

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*for General Concrete Construction*

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BLAW-KNOX expresses its interest in your job with real, fundamental reasons for applying proper equipment to the work, to the end that job progress will be better, costs lower, and that profits will be definitely assured.

The Blaw-Knox line of construction equipment is complete. Descriptive literature on any of these items will be sent upon request.

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Priced right — built right to give the kind of service that gets the profits out of jobs. When you need new equipment make your choice from the extensive CMC line of Mixers, Dual Prime Pumps, Hoists, Saw Rigs, Pneumatic-Tired Carts and Barrows. You will be money ahead in service — money ahead in profits.

CMC New Streamlined, Fast Moving Two-Wheel Trailers in 5s, 7s and 10s sizes.

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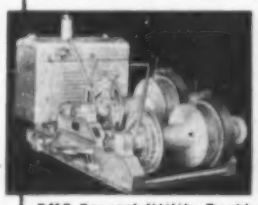

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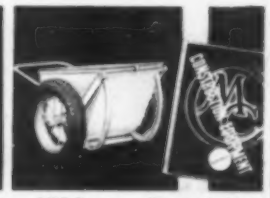

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# A NEW IDEA IN SCRAPERS

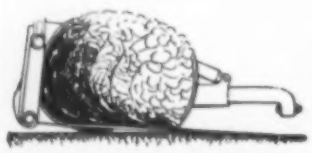
# BAKER

## HYDRAULIC SCRAPERS
### MODEL 190, 2½ CU. YD.

The new Baker Scrapers, for 20 to 30 H. P. tractors, using new principles and flat digging angle, get capacity loads faster and easier. Automatic rear clearance through compression springs permits ample clearance for dumping and spreading. They pile up yardage at new low costs. Larger sizes of this type to be announced when production begins.

*Send for Bulletin 804*

**THE BAKER MFG. CO.**
**568 Stanford Ave. Springfield, Ill.**



**LOADS AT REAR FIRST**

**DIESEL-POWERED ¾-YD. SHOVEL** loads top soil for road construction near Alapaha, Ga., at a rate of approximately 100 yd. per hour and uses only 1½ gal. of fuel an hour, according to The Thew Shovel Co., which has made available Caterpillar diesel engines for use with its Lorain-40 machines. This engine has a 4¼ x 5½ in. bore and stroke. Machine shown is owned by John Monaghan, Inc., of Pelham, Ga.—**The Thew ShovelCo., Lorain, Ohio.**

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**DIESELS FOR SHORT-HAUL DUMP-TRUCK SERVICE** are being used on hauling operations of B. Turecamo Contracting Co., of Brooklyn. This company bought two Cummins HB-4 diesels to replace gasoline engines in Mack chasses and used the trucks to transport sand, gravel and asphalt from

its main plant to various road construction projects. Distances traveled averaged less than 15 mi. per round trip. Fourteen months later owner took stock and found that diesels used by one-third the number of gallons of fuel consumed by gasoline-powered trucks. Found also that better time was made by diesel-powered machines. The result was that eighteen more Cummins diesels were ordered for installation in new Mack chasses. — **Cummins Engine Co., 1706 Wilson St., Columbus, Ind.**

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**LIGHT ½-YD. SHOVEL,** convertible to dragline, crane or trench hoe, has working weight of 25,000 lb. and embodies the following features: (1) Compact design; (2) elimination of useless dead weight by use of alloy steels and by heat treating; (3) anti-friction bearings to save lubrication and wear; (4) positive and independent chain crowd; (5) drop-forged 14-in.-wide crawler shoes; (6) unit cast car body and machinery table of nickel manganese steel, totally heat treated; (7) six-cylinder gasoline or diesel power with "E-Z" clutch control; (8) cut helical gears on all drum shafts — helical gear drive in oil; (9) safety worm boom hoist — positive swing lock; (10) cab in any position; (11) positive propelling lock-all controls from operator's seat. — **Bay City Shovels, Inc., Bay City, Mich.**

**PORTABLE GASOLINE GENERATOR** a.c. and d.c., for operating small tools in locations where access to regular supply of electric current is inconvenient may be carried by hand, mounted on pneumatic tires or on two-wheel trailers and drawn behind

light trucks or motor cars. These units, regardless of size, produce same kind of current received from power companies, an extra heavy extension between plant and building carrying power for operation of electric drills, chippers, planers, and electric sander. These units are made as small as 600 watts in d.c., this size weighing 71 lb. Other units directly in proportion in weight and dimensions. — **D. W. Onan & Sons, 43-51 Royalston Ave., Minneapolis.**

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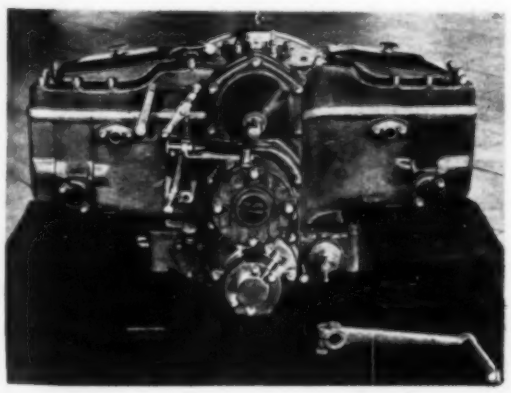
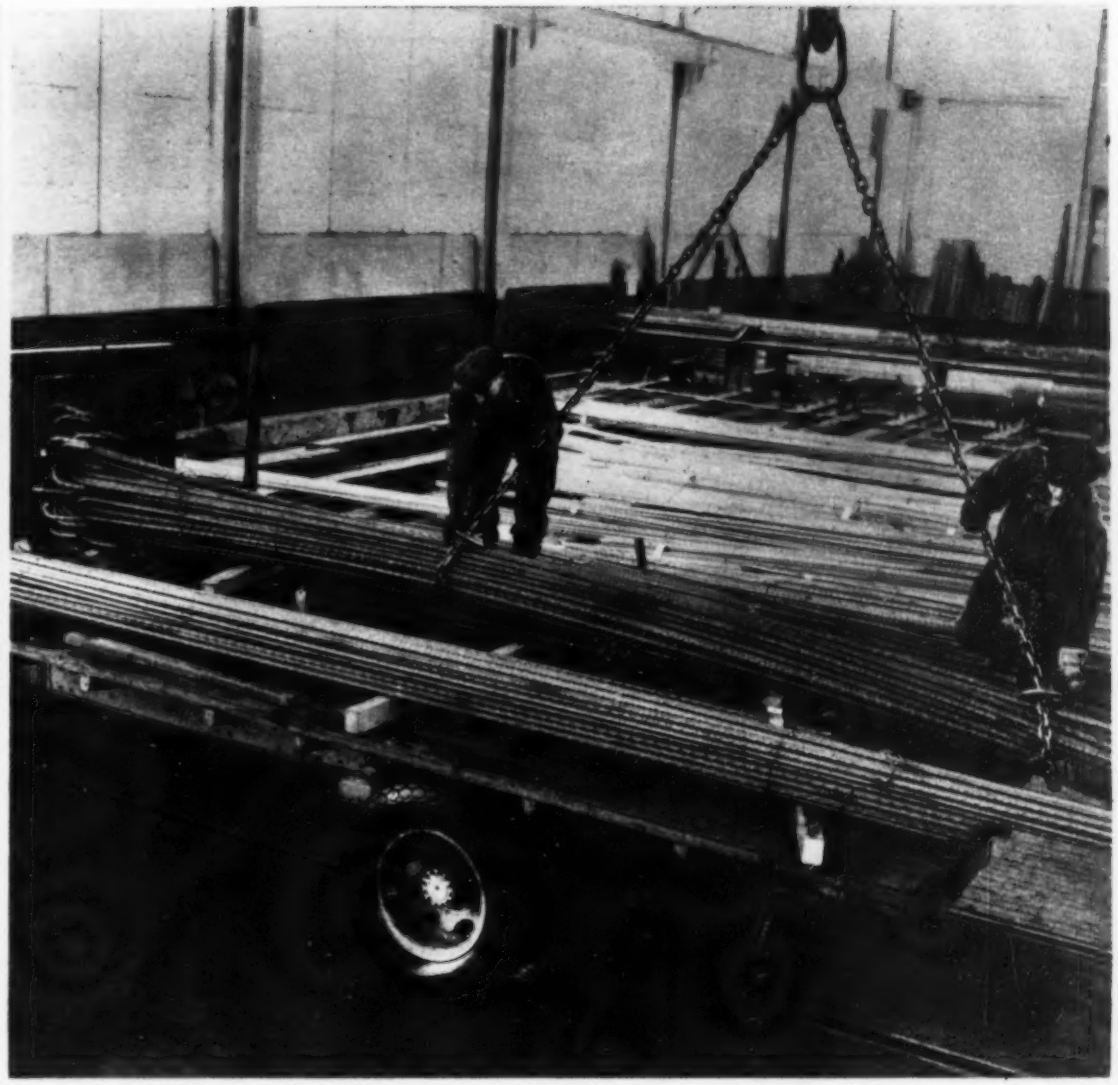
**LIGHTWEIGHT 15-18 HP. DIESEL ENGINES,** known as "Covic Diesel," combine diesel engine efficiency with weights comparable to standard gasoline motors and because of horizontally opposed or "pancake type" of cylinder placement permit installation in such equipment as compressors, conveyors, con-



crete mixers, pumps, small rollers, small tractors, trenches, welders and many other types of mobile and stationary machines. Covic Diesel engine is four-cycle, valve-in-head type with 3 5/32-in. bore, 3 15/16-in. stroke and 61-cu.in. displacement. Built-up, two-throw type ball-bearing crankshaft is both statically and dynamically balanced. Aluminum alloy or cast-iron crankcases. Lubricating oil pump sends oil from sump through edge-type filter, to main bearings, crank-pins and camshaft and then through hollow push rods over rocker arms and valve mechanism back to sump. Entire full assembly above cylinder block, permitting quick and easy inspection. — **Northill Co. Inc., 700 S. La Brea Ave., Los Angeles, Calif.**

# Reinforcing bars *rushed from warehouses in* key cities

Whether your order is large or small you can count on quick delivery when you order Reinforcing Bars from Bethlehem. Large stocks, strategically located, place this company in a position to supply steel quickly to any location.

When bending facilities are not available on the job, we are prepared to cut and bend bars to fit specifications. Bars furnished plain or deformed, round or square.

A call or postcard to our nearest district office will bring complete information on Bethlehem warehouse service.

**BETHLEHEM STEEL COMPANY**, General Offices: Bethlehem, Pa. District Offices: Albany, Atlanta, Baltimore, Boston, Buffalo, Chicago, Cincinnati, Cleveland, Columbus, Dallas, Detroit, Honolulu, Houston, Indianapolis, Johnstown, Pa., Kansas City, Mo., Los Angeles, Milwaukee, Nashville, New Haven, New York, Philadelphia, Pittsburgh, Portland, Ore., St. Louis, St. Paul, Salt Lake City, San Antonio, San Francisco, Savannah, Seattle, Syracuse, Toledo, Tulsa, Washington, Wilkes-Barre, York. Export Distributor: Bethlehem Steel Export Corporation, New York.

**BETHLEHEM STEEL COMPANY**

# Yes! There's EXTRA Wear and Service . . . in Dependable

# GOODALL WET WEATHER CLOTHING

**RUBBER COATS and HATS**
**OILED COATS • JACKETS • OVERALLS • HATS**
**"WEAR KING" and "TOE-SAVER" BOOTS**

*In Stock for Immediate Shipment*

**GOODALL RUBBER COMPANY**
5 SOUTH 36th ST., PHILADELPHIA, PA.
New York • Pittsburgh • Chicago • Cleveland • Houston

**GOODALL MECHANICAL CORPORATION**
San Francisco • Los Angeles • Seattle • Salt Lake City • Phoenix

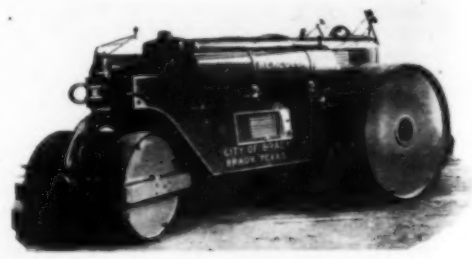
GOODALL — The originators of the "Standard of Quality" Line (Reg. U. S. Pat. Off.) of contractors rubber goods

You'll find Michigan Truck Shovels working away in quarries and pits, too — right along with the "big fellows"! Truck mobility puts the Michigan on any location at a moment's notice — and for high production, Michigan Truck Shovels are real competition for larger machines because Michigan Fingertip-Air-Controls mean extra passes — and real savings — every day! Write for Bulletins C and C2.
in Rough Stuff
MICHIGAN POWER SHOVEL COMPANY
Benton Harbor, Michigan


**PORTABLE ELECTRIC HAND SAW** for cutting wood, metal, stone, tile and compositions, said to have greater power, faster cutting speed and new safety features, has 9-in. blade and cuts to depth of 2⅞ in. Will cross-cut 3-in. dressed lumber and bevel cut

lumber 2⅜ in. thick at 45 deg. Blade has free speed of 3,600 r.p.m., as standard, with an optional speed of 5,000 r.p.m., and is protected by automatic spring-operated telescopic guard that rotates on ball-bearings. Model is 19 in. long and its frame and handle are designed for perfect balance so that it may be operated with least strain to hand. Special die-cast aluminum alloy frame. All shafts mounted on ball bearings. Blower arrangement keeps line of cut free of sawdust.—**Skilsaw, Inc., 3316 Elston Ave., Chicago.**

**WATER-BALLAST THREE-WHEEL ROLLERS** are claimed to lend themselves to wider range of applications in road building without material increase in investment. Photo shows one of new models — 7- to 8-ton size, weight of which with empty rolls is 14,000



lb. With rolls filled with water, weight is 16,000 lb. In addition, two large tanks mounted on side of roller frame will carry additional 100 gal., increasing total weight by 800 lb. — **The Hercules Co., Marion, Ohio.**

**BELL-BOTTOM JACK SCREWS** in 38 sizes have solid one-piece cast-steel base and double-ribbed collar reinforcement around threaded area of casting to insure added strength. One-piece steel screw has forged steel head surmounted by unbreakable drop-forged steel top firmly attached without use of pins. Load friction reduced to minimum by use of chrome molybdenum steel balls which rotate in machine-cut, grease-packed channel beneath drop-forged top, assuring smoother lifting action with minimum of effort under heavy loads. Roller bearing device also prevents jack from twisting under load. Smooth - surface machine-cut threads of correct pitch, depth and thickness, facilitate handling rated capacities safer, faster and easier. — **Duff-Norton Mfg. Co., Pittsburgh, Pa.**

**Saved 25%**
**in fabrication costs**

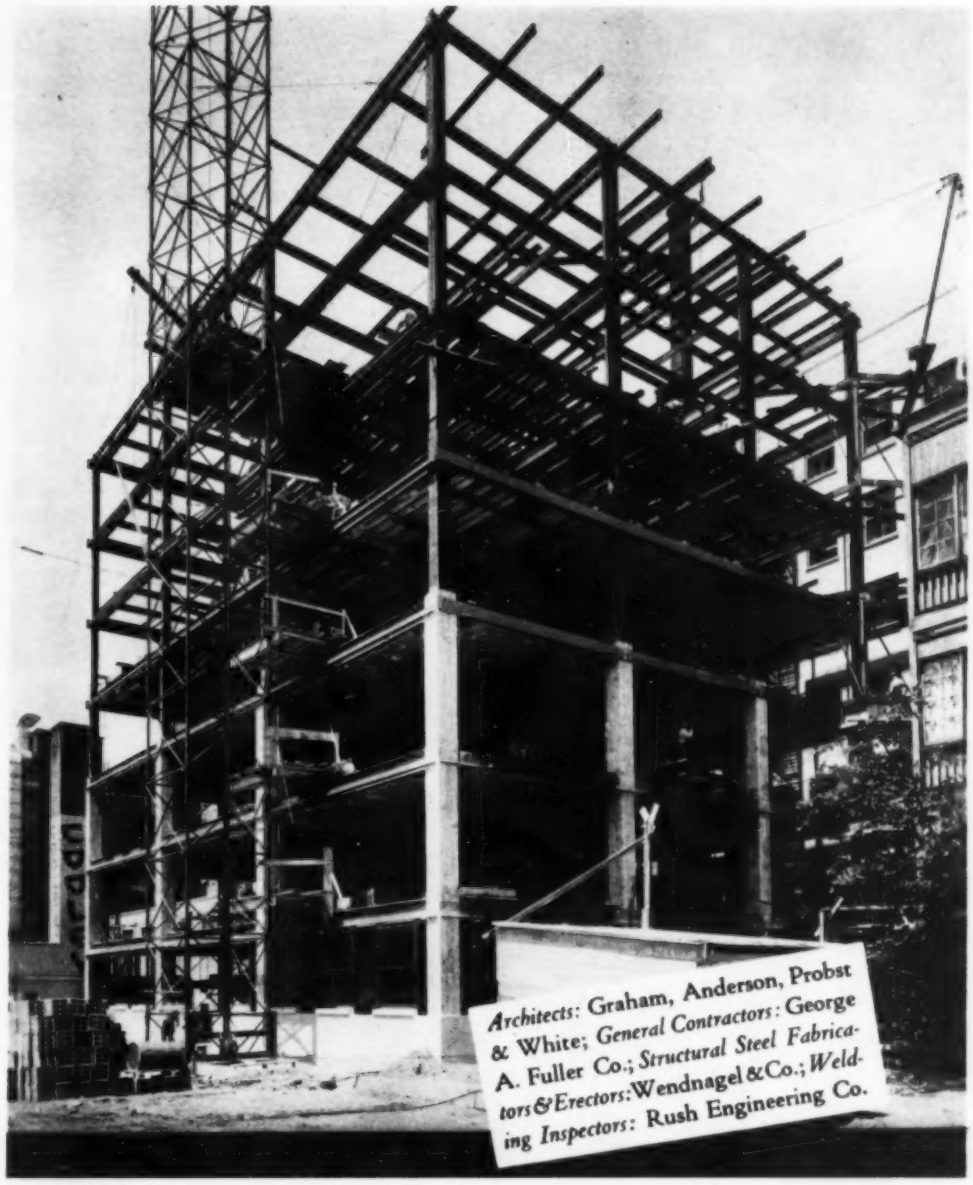
•

**Saved 10%**
**in erection costs**

•

**Saved 10%**
**in completion time**

•


Architects: Graham, Anderson, Probst & White; General Contractors: George A. Fuller Co.; Structural Steel Fabricators & Erectors: Wendnagel & Co.; Welding Inspectors: Rush Engineering Co.

# A BETTER BUILDING, BUILT AT LESS COST BY "*SHIELD-ARC*" WELDING

**Location:** Evanston, Ill. Owned by Washington National Insurance Co.

**Building Permit:** Issued by Evanston City Council when it learned about recently revised Chicago Building Code, Chapter 40, Article 4001, which permits welded building construction.

**Description of Building:** Tier type. All welded. Originally intended to be 4 stories. After steel erection, 3 additional stories were added, making 7 stories, 35,000 sq. ft. of floor space, 355 tons of steel. 14″ columns, 12″ beams, 24″ girders.

**Welding:** All shop and field welding with Lincoln *"Shield-Arc"* Welders and "Fleetweld" Electrodes. Total of 4375 ft. of shop welds, 1750 ft. of field welds.

**Results:** A stronger, stiffer structure than if riveted. Welded construction saved 25% in fabrication costs, 10% in erection costs, 5% in steel tonnage and 10% in overall construction time.

There are 60 Lincoln offices in the U. S., located in important industrial centers, and each one is staffed with skilled welding technicians. For information on the *"Shield-Arc"* welding of structures of all kinds, call the nearest Lincoln office, or **MAIL THE COUPON.** →

**THE LINCOLN ELECTRIC CO., Dept. G-530, Cleveland, O.**

☐ Send free Structural Studies as issued. ☐ Send free Welding in Construction Work (Bul. 421).

Name _____ Position _____

Company _____

Address _____

City _____ State _____

**LINCOLN**
LARGEST MANUFACTURERS OF ARC WELDING EQUIPMENT IN THE WORLD

# *Building* THE WORLD'S LARGEST MAN-MADE ISLAND

A spectacular job—building Treasure Island in San Francisco Bay for the 1939 Golden Gate International Exposition. Over a mile long, nearly a mile wide, formed of 20 million cubic yards of dredged sand, 287,000 tons of rock, and 80,000 yards of top loam. Construction materials include 10,000 piles, 30,000 yards of concrete aggregate, 30 million feet of lumber, 5,000 tons of steel, 250,000 feet of wire—a magic city on the world's largest man-made island.

MORE low-cost operating hours! On the world's biggest projects you'll find "RPM" Diesel Engine Lubricating Oil. There's a reason!

With "RPM"—the world's *first* and outstanding discovery in "Caterpillar" Diesel engine lubrication—you get more work done at less cost. It prevents ring-sticking, keeps pistons free from carbon, avoids gummed valves, maintains piston seal—saves operating time and money all around.

Try it in *your* "Caterpillar" Diesel—you'll learn why more "RPM" Diesel Engine Lubricating Oil is used in "Caterpillar" Diesel engines than all other Diesel oils combined.

**RPM**
REG. TRADE MARK
**DIESEL ENGINE LUBRICATING OIL**

*Approved by*
CATERPILLAR TRACTOR CO.

**STANDARD OIL COMPANY OF CALIFORNIA**

RPM
DIESEL ENGINE LUBRICATING OIL

**A truly modern oil that does more than lubricate perfectly**

On construction jobs, in power plants, in the woods and on the farm, "RPM" Diesel Engine Lubricating Oil is helping Diesel tractor owners to earn more profits.

It is made to prevent ring-sticking, reduce non-operating hours and end overhauls for carbon removal. When drained it removes dirt and carbon which it holds in suspension.

If your equipment is "Caterpillar" Diesel, this is *your* oil. "RPM" Diesel Engine Lubricating Oil is distributed by the following companies under the brand names indicated:

**IN THE UNITED STATES**

**"RPM" Diesel Engine Lubricating Oil:**

THE CALIFORNIA COMPANY (Montana only)
THE CARTER OIL COMPANY, Tulsa, Oklahoma
HUMBLE OIL & REFINING COMPANY
STANDARD OIL COMPANY (Indiana)
STANDARD OIL COMPANY (Inc. in Kentucky)
STANDARD OIL COMPANY (Nebraska)
STANDARD OIL COMPANY OF CALIFORNIA
STANDARD OIL COMPANY OF TEXAS
UTAH OIL REFINING COMPANY

**Diol "RPM" Diesel Engine Lubricating Oil:**

COLONIAL BEACON OIL COMPANY, INC.
STANDARD OIL COMPANY OF LOUISIANA
STANDARD OIL COMPANY OF NEW JERSEY
STANDARD OIL COMPANY OF PENNSYLVANIA

**Signal "RPM" Diesel Engine Lubricating Oil:**

SIGNAL OIL COMPANY

**Sohio "RPM" Diesel Engine Lubricating Oil:**

THE STANDARD OIL COMPANY (Ohio)

**IN CANADA**

**"RPM" Diesel Engine Lubricating Oil:**

IMPERIAL OIL COMPANY LIMITED
STANDARD OIL COMPANY OF BRITISH COLUMBIA LIMITED

**THROUGHOUT THE WORLD**

"RPM" Diesel Engine Lubricating Oil is also available through distributors in more than 100 other countries.

Get in touch with your nearest distributor—for a clean engine, and long hard service with the minimum of overhaul.

WORLD-WIDE ACCEPTANCE

**ASBESTOS-CEMENT PIPE** for use by municipalities, utilities and industry in general is available in four standard pressure classes of 50, 100, 150 and 200 lb. per square inch and in sizes ranging from 2 to 24 in. in diameter. All pipes have plain ends. Standard lengths of Century pipe sections are 10 ft. for small diameters and 13 ft. for diameters of 4 in., or more. Joints are made with flexible couplings consisting of malleable-iron middle ring, followers and rubber gaskets, reducing possibility of breakage due to settling of line. Ratchet wrench is only tool needed to install joint coupling. Pipe bends are supplied for 22½-, 45- and 90-deg. angles. For handling certain industrial fluids interior of pipe is given protective bitumen treatment. Pipe walls of asbestos-cement can be cut, drilled or topped for service connections in same way as for metal pipe. Hydraulic properties of pipe are indicated by a value of 140 for the coefficient "C" in the Williams & Hazen formula for flow. — **Keasbey & Mattison Co., Ambler, Pa.**

**FEATHERWEIGHT DRILL RIG** features automatic chain feed which is said to increase drill footage more than 100 per cent a shift over that of hand held drill by insuring proper feed pressure at all times for all types of rock. Other advantages: (1) Uses less air and less gasoline; (2) can be handled by one man; (3) saves on labor costs. Uses Sullivan hand-held drills; (4) less time spent in changing steels and in pulling stuck steels. — **Sullivan Machinery Co., Claremont, N. H.**

**HEAVY-DUTY EXCAVATOR**, 1½-yd. capacity, convertible for dragline, clamshell, crane or drag shovel service, is made of alloy steels with welded construction used to produce machine said to combine smooth working operation, speed, mobility, strength with dependability in digging service expected of this type unit. Unusual features: (1) Unusually long caterpillar frames reduce "nosing in" when digging; (2) side frame of unit steel castings; (3) welded, lightweight, strong box-girder boom; (4) modern hoist and chain crowd; (5) manganese steel casting "V" type front dipper with sockets for patented, inserted teeth and curved plate door; (6) high-speed shafts operating on ball and roller bearings; (7) elimination of dead weight resulting in snappier swing action and high speed output; (8) wide-faced clutches to hold adjustments accurately; (9) simple lubrication. Gasoline, diesel or electric power. — **Bucyrus-Erie Co., South Milwaukee, Wis.**

"FLEX-PLANE FINISHING MACHINES"

A fleet of "FLEX-PLANE" finishing machines were used exclusively to build the deck of the great Triborough Bridge. Photo by Jaques shows one of its beacon lights.

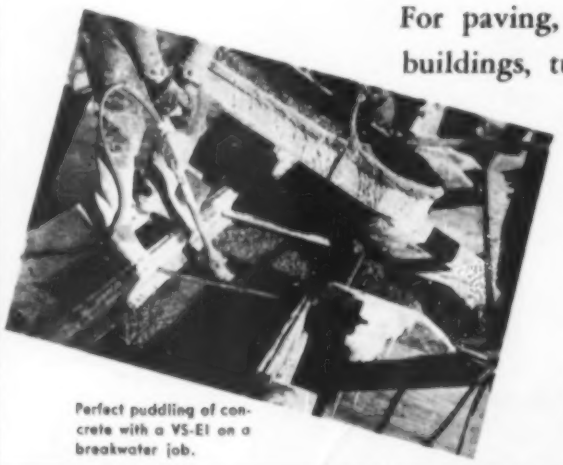
FLEXIBLE ROAD JOINT MACHINE CO.
Warren, Ohio



THE
JACKSON "VS-E1" VIBRO-SPADE
PLACES CONCRETE ON
ANY and ALL
JOBS

VS-E1 With
SHORT RIGID HANDLE
*Also With Handle Bent for Paving*

VS-E1 With
SHORT FLEXIBLE HANDLE
*Also With 12' Flexible Handle*



Perfect puddling of concrete with a VS-E1 on a breakwater job.

For paving, walls, breakwaters, locks, dams, buildings, tunnels, bridges, foundations and grade separations the VS-E1 JACKSON VIBRO-SPADE is speedy, economical, efficient, durable and dependable. 4" in diameter. Easily handled by one man. Write immediately for illustrated literature giving complete descriptions and specifications.

ELECTRIC TAMPER & EQUIPMENT CO.—LUDINGTON, MICHIGAN


**FOUR TRUCKS** like this one are to be used in hauling rock from Delaware aqueduct, now being built for New York City. Mechanical specifications include: 198-hp. engine; 13-in. two-plate clutch;

four-speed transmission with dual range transfer case; 150-in. wheelbase; double reduction axles; 12.00x24 lug-type tires; disk wheels; 8-cu.yd. water level dump body with automatic down folding tailgate and twin telescopic hoists mounted outside frame. Chassis weighs 14,000 lb. and has road speed of 35 m.p.h.—**Four Wheel Drive Auto Co., Clintonville, Wis.**

---

**FLOOR SANDER,** streamlined, medium-weight machine, is given low center of gravity by locating motor in, rather than on, chassis, with two pins as a rear support. Balanced 8-in. drum, driven by V-belt and traveling at surface speed of 3,835 r.p.m., is mounted on rubber ball bearings that allow drum to

follow surface of any floor without bearing strain. Drum arms mounted on Neophrene (synthetic, non-deteriorating rubber) to absorb vibration and eliminate chatter marks. Swivel dust tube allows dust bag to be turned to either side of machine, eliminating wall rubbing. Ratchet control enables operator to adjust drum pressure to equalize abrasive paper wear, thereby saving paper and giving floor exact sanding required. For portability motor may be removed in less than minute without tools and as quickly replaced. For use either with 110- or 200-v. current, without wire change.—**Porter-Cable Machine Co., Syracuse, N. Y.**

---

**RUST SOLVENT,** in form of semi-paste, is designed to remove corrosion before painting and protect metal surfaces of contractors' equipment. Paste does not dry out and is easy to apply with brush. Can be spread to cover 700 sq.ft. per gallon. When rust is dissolved metal surface is rubbed down with steel wool prior to application of paint.—**Nielco Chemical Co., 5411 Cicotte Ave., Detroit, Mich.**

# *It's Easier*

## to get a Good Job with ARMCO Pipe

1 No special equipment except ropes and plank skids is needed to lower the pipe into the trench.

2 It's easy to place each section with the smooth bituminous pavement squarely in the bottom.

3 Strong, tight joints are made quickly and simply with the Armco bolted connecting band.

Engineers and contractors everywhere praise Asbestos Bonded Armco Pipe because it's so easy to handle and install. No heavy machinery is needed. And there's no danger of the pipe chipping, breaking or injuring workmen.

These features naturally mean quicker, easier installation. And since Asbestos Bonded Armco Pipe can be specified in 20 foot lengths, you save up to 1056 joints per mile. That's why Armco pipe costs only one-fourth to one-tenth as much as rigid pipe to lay, line and join. Because of its great strength, flexibility and sturdy joint connections, Armco pipe also requires less excavation, less care in preparing the foundation.

Vote for these features on all your drainage and sewer jobs and you'll save time, money and grief. What's more, by using Asbestos Bonded Armco pipe you'll gain increased permanence. Armco Culvert Mfrs. Association, Middletown, Ohio.

ARMCO

*Asbestos Bonded*

**ARMCO PAVED INVERT PIPE**

MODEL P-A PLANTS ARE BUILT IN 4 SIZES

MODEL PA-15
1500 ≠ Mixer

MODEL PA-20
2000 ≠ Mixer

MODEL PA-30
3000 ≠ Mixer

MODEL PA-40
4000 ≠ Mixer

# A NEW PORTABLE ASPHALT PLANT

in completely assembled sectional units easily moved by truck or rail and quickly erected without the use of a crane or gin pole.

Patents applied for — Built in 4 Sizes

*Write for Bulletin T-260*

**HETHERINGTON & BERNER, INC.**

**701-745 Kentucky Avenue — Indianapolis, Ind.**

**MARKING CRAYONS** for use on metal, wood and other surfaces are intended to serve as "a brushless paint in stick form." "Duramark" crayons in six colors — white, blue, red, yellow, green and black — are intended for use by construction men, shipbuilders, surveyors and lumber men. When crayon mark has set it is claimed to be waterproof and as permanent and durable as ordinary paint. For use in marking on hot steel and other metals a crayon called "Hot-Rite" is available. The company also furnishes lumber crayons and carpenters' pencils.—**Eberhard Faber Pencil Co., 37 Greenpoint Ave., Brooklyn, N. Y.**

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**WOODEN STRAIGHT-EDGE BLADE.** 1 in. thick x 10 ft. long, with a blade width of 6 in. at the middle, tapering to 3 in. on each end is made of finest grade of white pine or cypress, to fit into L & M Standard Giant Gript steel handle. Requires no sway braces because of famous drop forged connector. Designed for use where state highway engineers prefer wood to steel blades for concrete checking purposes.—**L & M Manufacturing Co. 10300 Berea Road, Cleveland, Ohio.**

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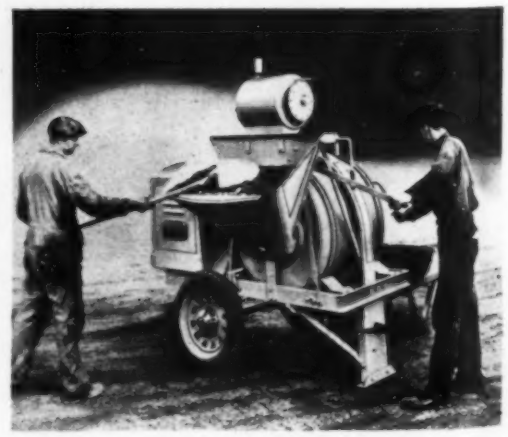
**LIGHTWEIGHT NON-TILT TRAILER MIXER** can handle 30 to 40 cu.yd. per day because it has a measuring batch hopper of same capacity as drum which may be loaded while previous batch is being



mixed and discharged, thus eliminating waiting between batches as well as saving cost of power loader. Features: (1) Drum with criss-cross remixing action; (2) large buckets for fast discharge into forms or barrows; (3) chilled drum rollers operating on ball-bearing shaft; (4) syphon-type water tank, 7-gal. capacity, with quick setting dial; (5) 2½-hp. engine, fully inclosed; (6) pneumatic tires, Timken bearings, shock absorbers and disappearing towing pole for trailing behind light cars.—**Jaeger Machine Co., Columbus, Ohio.**

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*Built to Give You a Two-Way Saving!*

*Washer Type, Style W-16*
*Ground Joint Type, Style X-34*

# "BOSS" HOSE COUPLINGS

On steam, air or liquid lines . . . high or low pressure . . . these dependable couplings not only provide insurance against leaks, pressure losses and shut-downs, but also protect the hose and make it last much longer. It will pay you to specify "BOSS" Couplings every time you order hose.

All parts steel or malleable iron, to withstand abuse, and cadmium plated to prevent rust. Sizes: ¼" to 4" inclusive. 1" and larger have new "BOSS" Offset Clamp, the last word in clamping efficiency.

*Stocked by Leading Rubber Manufacturers and Jobbers*

**DIXON VALVE & COUPLING CO.**

**MAIN OFFICE AND FACTORY: PHILADELPHIA**

*Branches in Los Angeles and Houston*

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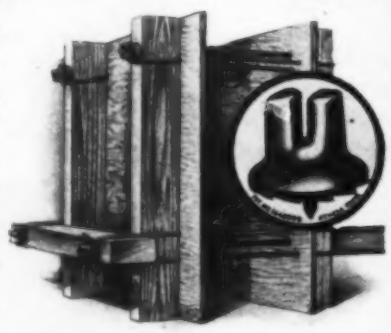
*Simple Speedy Safe*

**SAVES TIME— MONEY—**

# NEPTUNE WIRE-TIE BUTTON

Trebles efficiency of wire —not "burned" by twisting • Used on studs or wales (no double wales) • Only one button per tie • Positive grip — no slip • Unlimited take-up • Foolproof.



**IT'S THE LOW COST MODERN WAY**

Malleable cast button gives unlimited service on all jobs. Tied on one side only — outside wall. Just a twist of the wrist. Used on more than 400 jobs in ONE YEAR around Los Angeles alone — enough to build a concrete wall 45 ft. high, 10 miles long.

*YOU, TOO, CAN "SAVE WITH SAFETY"*

**NOTE — We manufacture a wide variety of form specialties, each a time and money saver. Write for printed matter.**

***Distributors and Dealers Wanted.***

**NEPTUNE MANUFACTURING CO.**
**117 E. 23rd Street, Los Angeles, California**

*See what the*

# REX 160 PUMPCRETE

DID IN *Neenah, Wisconsin*

## ANOTHER CONTRACTOR TURNS TO THIS NEW PORTABLE CONCRETE PUMP!

As it did to contractors in New York and San Francisco—in Montreal and Mexico—in Neenah, Wisconsin, the Rex 160 Pumpcrete "sold" itself to KOEPKE CONSTRUCTION CO., as the ideal concrete placement system for jobs of 5,000 yards or less.

Here, this popular concrete pump placed 5,000 cu. yds. of concrete into foundation, walls, beams, columns, slabs of this modern warehouse. Sixty-five feet up to the fifth floor—one hundred and fifty feet across to the farthest end of the building—working at almost peak load more than half the time. This husky machine again showed that it has the stamina to stand up under modern job conditions and the ability to average between 15 to 20 cu. yds. of concrete into the forms every hour—all day, every day, until the job is done.

The Rex 160 Pumpcrete also brings new ease and lower yardage costs to small jobs, including overpasses, underpasses, viaducts, bridges, culverts, foundations, sewage plants and small dams. See what possibilities it has for you—see how well it pays to "forget the old stuff"!

*Now*

## SEND FOR THIS NEW BOOK!

Facts and figures are what count. This new book, "Presenting the Rex 160 Pumpcrete," answers all your questions about this new machine—shows exactly what it has done on many types of construction work. It will help you solve your 1938 job problems. Send for it today. Use handy coupon below.

CHAIN BELT COMPANY,
1664 W. Bruce St., Milwaukee, Wisconsin
Gentlemen:
Please send me my copy of "Presenting the Rex 160 Pumpcrete."
*Firm Name*.....
*By (Title)*.....
*Address*.....
*City*.....*State*.....

REX

PROCESS—GIESE SYSTEM—KOOYMAN

PUMPCRETE

CHAIN BELT COMPANY of Milwaukee

**With a One Hundred Per Cent MORETRENCH Wellpoint System**

***Results*** **A BONE DRY TRENCH**

**SHEETING and BRACING ELIMINATED**

We can do the same for you. Send us full details on your wet work and we will furnish you with a guaranteed proposal.

**MORETRENCH CORPORATION**
***Sales and Rental Office:* 90 West St., New York**

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**TWO NEW TRUCK MODELS** with rated capacity of 3 to 4 tons and gross vehicle weight of 20,000 lb. are designed for mounting wide variety of auxiliary

equipment and bodies. Recommended mechanical features: 5-speed transmission; midship sliding jaw clutch on one model and sliding gear unit type clutch on other; 14-in. single plate clutch. Single reduction, bevel gear type, full-floating axles, with split type housing, both front and rear. 9.75 x 20 tires; 71-in. tread; 150-in. wheelbase. — **Four Wheel Drive Auto Co., Clintonville, Wis.**

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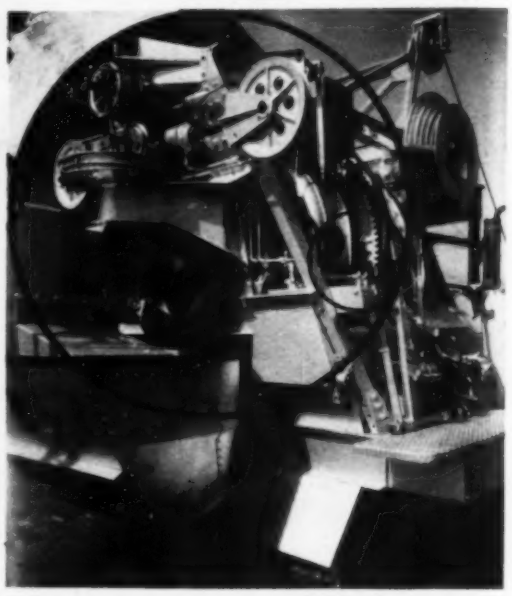

**FINGER-TIP HYDRAULIC CONTROLS** now available on single and dual drum pavers are said to make operator's day's work much less tiring, more effective, safer and speedier, allowing him to use more mental efficiency in operating paver and to increase output. Hydraulic mechanism controls boom swing, discharge chute, transfer chute and water tank valves and is maintained by simple oil pump driven off engine transmission shaft. Other advantages: (1) Better control of boom; (2) elimination of many moving parts; (3) lessening of accident risk; (4) quicker release if aggregates become jammed, eliminating breakage — **Ransome Concrete Machinery Co., Dunellen, N. J.**

---

**ACOUSTICAL WALLBOARD** called "Acoustilite" applied to walls and ceilings said to absorb sound, reducing noise made by clicking of business machines and rattle of dishes in restaurants, as well as disturbances in classrooms, corridors and assembly rooms. Also recommended for improving sound reception in theatres and churches. Made in two finishes, one with appearance of soft-surfaced Travertine stone and other an open-mesh fabric covering. Both painted neutral buff shade. Furnished in squares and rectangles for arranging in decorative patterns. Also recommended for insulation properties. — **The Insulite Co., Builders Exchange Bldg., Minneapolis, Minn.**

---

**ON-THE-JOB PROOF of DEPENDABLE PERFORMANCE**

GORMAN & RUPP PUMPS
UNSURPASSED FOR PUMPING FAST

Three 8-inch G & R self-priming centrifugal pumps make play of draining muddy water on Cape Cod Canal project at Boston.

**MUDDY WATER IS THEIR DISH —24 HOURS A DAY!**

You can bank on it—G & R pumps WILL NOT CLOG—they ASK NO TIME OUT. Let G & R Pumps tell their own story on the job. They will deliver as much (often more) water under any conditions than any other pump. We will ship you one and let you be the judge.

PROMPT DELIVERY from Stock in 100 Principal Cities

**THE MOST DEPENDABLE PUMPS FOR THE LEAST MONEY**

WRITE ↘ THE GORMAN-RUPP CO., Mansfield, Ohio

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**Put *SPEED* Into Concrete Placing With *Mall* VIBRATORS**

When MALL Concrete Vibrators are applied to concrete of low water cement ratio, the concrete levels rapidly into place reaching the most inaccessible points of the forms. The concrete is packed firmly against the reinforcing steel and forms, honeycombs eliminated, and the strength and appearance of the concrete greatly improved.

There is a MALL vibrator — gas engine, air, or electric — with vibration frequencies from 5,000 to 10,000 per minute for each specific concrete placing job. You are certain of a better job with a MALL vibrator — a job that will pass the most rigid inspection.

Bulletins describing the various models will be sent upon request.

*MALL Universal Electric Vibrator. Delivers vibration frequencies of 10,000 per minute. This unit is easy to handle and lift through openings in the forms.*

**MALL TOOL COMPANY**
**7757 South Chicago Avenue, Chicago, Ill.**

Without obligation, please send additional information on MALL Concrete vibrators.

*Name* .....

*Address* .....

*City* ..... *State* .....

As general superintendent, R. B. Whyte is responsible for every operation in the Macwhyte plant. "Quality, rather than tonnage, has always been our first aim in making Macwhyte Wire Rope," explains "R. B."

# It's the HUMAN ELEMENT that controls the quality of Macwhyte PREformed Wire Rope

● Why do some makes of wire rope give much better, much longer, service than others?

You know most of the reasons: better materials . . . efficient manufacturing equipment . . . rigid laboratory and neld tests. These are absolutely necessary in building long life into wire rope.

But *most important* in manufacturing *better* wire rope are the *men* who make it!

**Men, as well as materials, control quality**

"We use the finest steels, the most modern machinery," explains R. B. Whyte, General Superintendent, "but it's the 'human element' that controls the high quality you find in Macwhyte PREformed.

**Quality, rather than tonnage, Macwhyte aim**

"We've always based compensation on quality workmanship, never tonnage. As a result our workmen take a pride in their jobs. They've become experts in their lines. And the Macwhyte Wire Rope they make is *better* wire rope."

Over the years, this policy of "quality rather than tonnage" has proved sound. For today there are more users of Macwhyte PREformed and Regular Wire Rope than ever before.

NO. 376

**MACWHYTE COMPANY**
KENOSHA, WISCONSIN

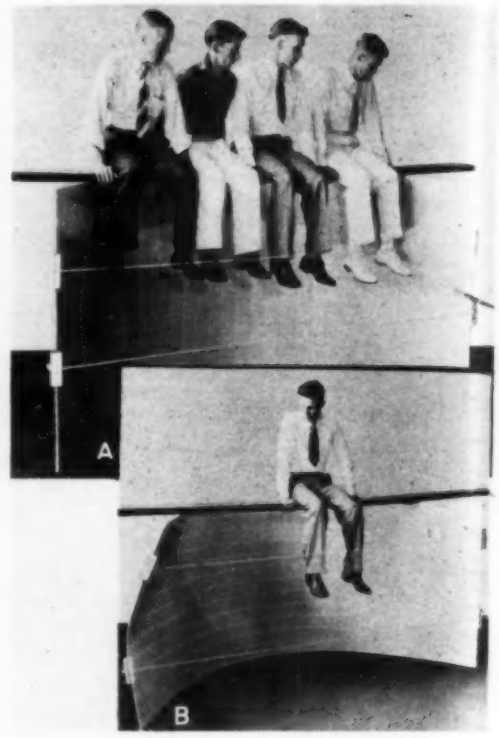
Manufacturers of wire rope and braided wire rope slings.

Distributors and stock throughout the U. S. A. for quick service.

**MACWHYTE**
*Whyte Strand – PREformed*
THE WIRE ROPE WITH THE INTERNAL LUBRICATION

# Own an Oven Bucket

for: Versatile Performance
Economical Operation
Durable Construction




**HEAVY-DUTY FIBER-TILE WALLBOARD** may be had in panels ⅜ in. thick, and 4x12 ft. in size, scored in 4 in. tile-like squares. Finish is natural ivory and surface is hard and smooth requiring a minimum of enamel. Board is exceedingly tough and of rigid character, for long and hard usage. Unusually high in insulating value. Recommended for use in kitchens and bathrooms and especially for washrooms in office and industrial buildings. — **The Upson Company, Lockport, N. Y.**

---

## This Unusual Alloy Tool-Steel Wheel-Blade Gives You

- Faster
- Lower Cost
- Pipe Cutting

Your skill at mechanics makes it easy for you to see why this RIDGID Cutter with its new style wheel-blade can cut pipe more quickly and cleanly and last far longer, giving you extra economy.

For the RIDGID knife-like blade is coined out of fine tool steel, hammered, heat-treated and then assembled in the hub. That's what gives it the unusual stamina for hundreds of extra cuts, reducing your cutter wheel expense as thousands of users have found.

Powerful housing, guaranteed warp-proof, always cut true, twirls easily to your pipe size. You like the "feel" of this tool, enjoy working with it.

For time and expense saving and a tool you get a "kick" out of owning and using, buy the RIDGID Cutter—at your Supply House.

**THE RIDGE TOOL CO. • Elyria, O.**

**RIDGID PIPE TOOLS**

---

TRADE MARK DOBBIE ESTABLISHED 1862

# All Steel DERRICKS

## Guarantee Safety

Steel Erectors Guy Derrick, with Ball Bearing Footblock.

When you guarantee safety, you economize—for safety means uninterrupted operation and lowest possible maintenance costs.

And DOBBIE All-Steel Derricks have been designed for safety and consequent economy. They have a safe load capacity of almost twice their rating. You need this assurance of dependable safety and continuous performance.

SAVE POWER BY USING BALL OR ROLLER BEARING FOOTBLOCKS AND SHEAVES. Built in both Guy and Stiff-leg types. Write for information and prices.

**Dobbie Foundry & Machine Co.**
**Niagara Falls, N. Y.**

*Other Dobbie Products*—Steel Derricks, Timber Derrick Fittings, Hand Winches, Motor Driven Winches, Blocks, Sheaves, etc.

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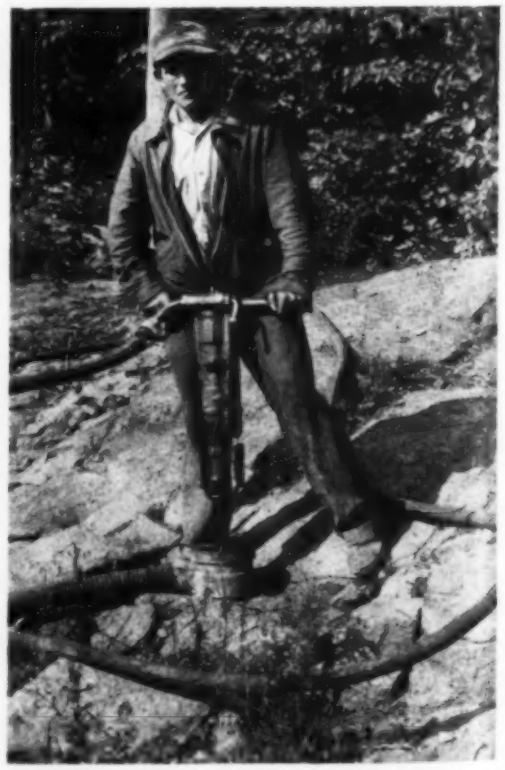
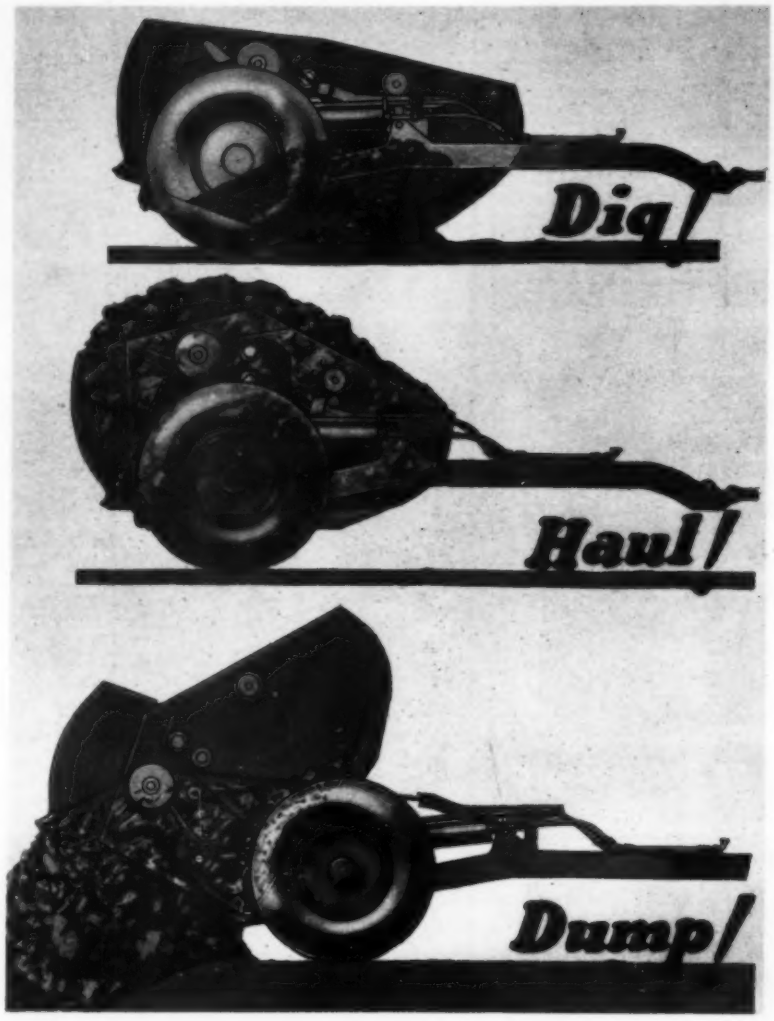


**CONTROL OF DUST** caused by drilling in mines and quarries is made possible by use of portable and stationary "Drill-Vac" consisting of vacuum producer, dust separators, vacuum hose lines and vacuum hood applied at top of drill hole. Unit offers following worthwhile advantages to user, according to manufacturer: (1) Improved working conditions; (2) protection of health of drillers; (3) control of drill dust, including finest particles which cause silicosis; (4) increase of drilling speed; (5) saving in cost of insurance. — **The Spencer Turbine Co., Hartford, Conn.**

# Why CONTINENTALS MOVE Dirt FASTER and CHEAPER!




They get down and dig. The wheels don't hinder the digging operation—rather, they aid it by adding their weight on the cutting blade. The sharp curved cutting blade planes off a layer of soil whether it's loose or packed hard, and routes it up into the digging bucket where it tumbles over onto the front dirt carrying apron out of the way of the incoming load. Digging depth is readily controllable—from 0" to 12".

While they're digging and loading, they're hauling; on their way to the dump. That's why Continentals move dirt faster—because they haul while they dig and load—saving as they go by replacing costlier dirt handling equipment and doing a better job faster. Continentals move dirt, sand, gravel, gumbo, shot rock, imbedded roots; in fact, anything the tractor can pull through, and they'll dump anything that they load.

They back-dump like a truck out of the way of the wheels, over a bank, into water, against a wall, in windrows or stock piles; and are used for spreading, grading and leveling, too. No need for bulldozing with a Continental on the job. They use no troublesome cables, no winches, no counterbalances — just the simple Be-Ge Hydraulic Control Unit. Operating a Continental is as easy as turning on a faucet. The operator is an expert after a few round trips. Maintenance, too, is simple—just occasional lubrication and keeping the pump tank full.

In any kind of soil, under any conditions, Continentals move dirt at the lowest per yard cost whether you use a 4, 5, 7 or 10 yd. model on crawlers or low pressure tires. Continentals dig out profits for you that you never knew existed. By all means get the complete story before buying dirt moving equipment for your next job.

Sold and serviced by Allis-Chalmers dealers everywhere.

A 7 yd. Continental on Crawlers doing a tough stripping job on an Ohio fill project. On this, as on all dirt moving jobs, Continentals do it faster and cheaper!

**CONTINENTAL ROLL & STEEL FOUNDRY CO.**

*Tractor Equipment Division*

14370 Railroad Ave. EAST CHICAGO, INDIANA

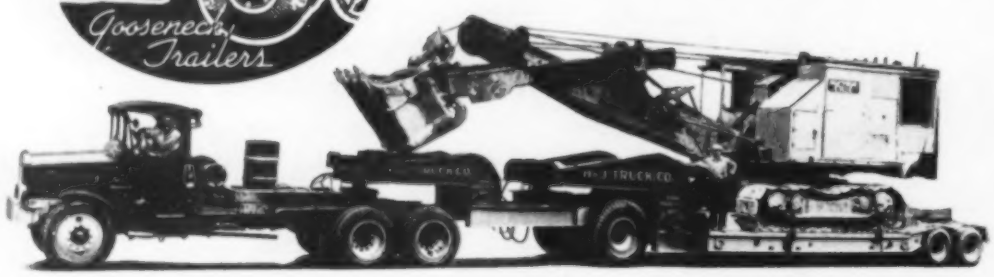
# CONTINENTAL WAGON SCRAPERS

# ROGERS TRAILERS

EMBODY THESE

## 3 ESSENTIALS

ROGERS HEAVY DUTY Gooseneck Trailers



**LOADABILITY**— Quick, easy loading due to extremely low construction.

**HAULABILITY**— Lightness with strength, permitting speedier travel at less cost.

**BREAKEABILITY**— Safe, dependable control at all times due to the new equalizing brakes.

WRITE FOR CATALOGUE

EXPERIENCE • *built it ...* ROGERS BROTHERS CORPORATION 135 Orchard St., Albion, Pa. • PERFORMANCE *sold it ...*



*The New* **TRANSIT**

PIONEER OF TRUCK MIXERS

**Sets a new standard *in concrete quality —and economy!***

Mixing blades designed strictly for MIXING. Water injected with great rapidity under pressure.

Proportioned for ideal weight distribution. Low center of gravity. *Mixer frame* takes up all thrust, torsional or other strains. Discharge controllable from rear, or from driver's seat. In brief — more and better concrete for lowest operating and maintenance cost.

**SEND FOR THE TRANSIT CATALOG**

•

**TRANSIT MIXERS, Inc.**

75 West St., New York City, N. Y., U. S. A.



*Your Shovels Can't Go Any Faster* THAN THE OPERATORS CAN WORK THEM!

Type HX

THE **UNIVERSAL** *Semi-Automatic* **DIPPER TRIP** *and* **TAGLINE WINDER**

Will add 10% or better to yardage of any power shovel (1) by speeding Trip Action (2) Eliminating lost motion (3) Conserving operator's energy.

**HOW IT WORKS**

Dipper tripping control is part of one of regular operating levers. Operator needn't take hand off lever. A wrist twist trips bucket instantly. Pays for itself in a very short time.

**AND WILL ALSO**

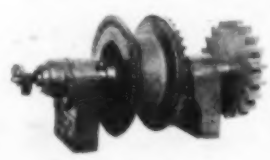
Will trip a skimmer scoop and a pull shovel — no changes.

As a Tag Line Winder on clamshell work gives operator complete control over movement of clamshell, speeds production.

Dipper trip changed to tagline winding by simply changing slack take-up spring, installing longer line.

• **Now standard equipment** on the following makes of machines:

Lima Locomotive Works, Inc.—Shovel and Crane Division.
Byers Machine Co.
Speeder Machinery Corp.
Marion Steam Shovel Co.
Browning Crane and Shovel Co.
Most shovel manufacturers will equip their new shovels with this dipper trip and tagline winder on request.

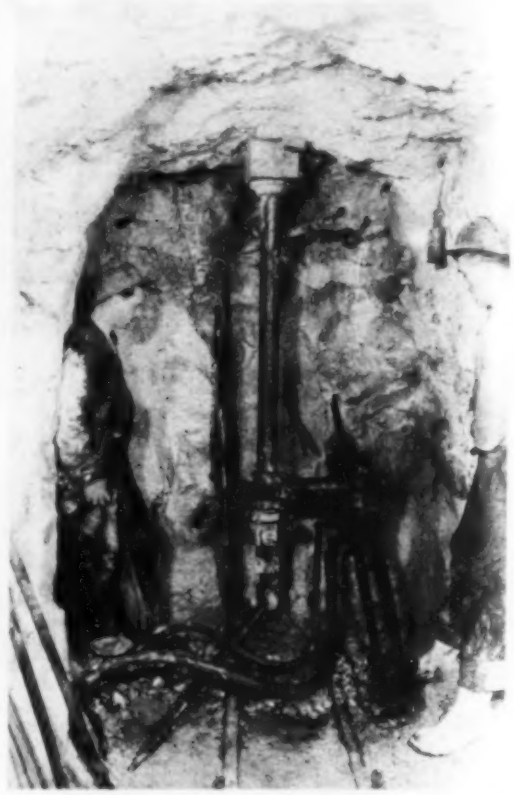


Type H

• *Write for full particulars specifying make, model, size and year of shovel.*

MORIN MFG. COMPANY 166 Race St. Holyoke, Mass.

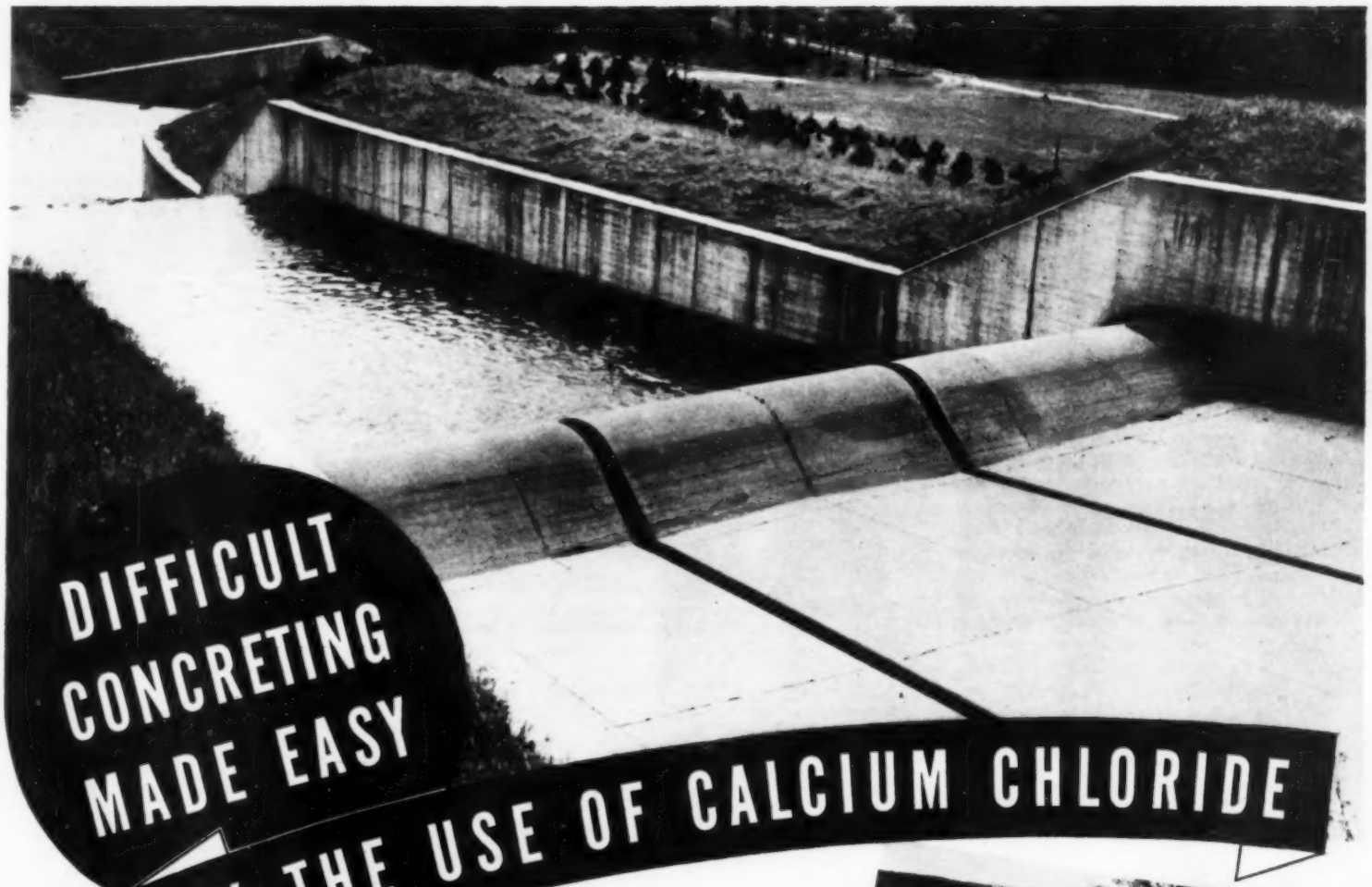

**AUTOMATIC CHAIN-DRIVE DRIFTER DRILL,** called "Adjustafeed," combines chain drive, adjustable feed, few working parts, convenient control, and freedom from direct shock to produce following results for user, according to manufacturer: greater footage, ease in operation, flexibility, longer life,



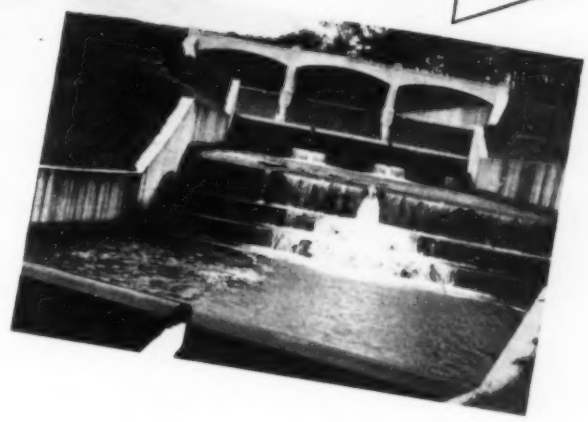
more all-around efficiency. Three major parts: (1) simplicity of feed control — no toggles or double ratchets; (2) compact housing with oil reservoir and large ground surfaces for abundant bearing area; (3) driving sprocket with large bearing area and increased number of ratchet teeth to insure positive feeding. — **Sullivan Machinery Co., Claremont, N. H.**

**LIGHTWEIGHT GAS ENGINE UNIT** with wide utility range is especially recommended for use in drilling, sanding, wire brushing, concrete surfacing and finishing, and grinding and sharpening tools and bits. Unusually portable. Can be carried easily by

one man and suspended from rope or hook when necessary. Operates independently of air compressors or generator sets. Power is transmitted from single cylinder, four-cycle air-cooled gas engine to working tool by heavy-duty flexible shafting —**Mall Tool Co., 7740 S. Chicago Ave., Chicago, Ill.**



# DIFFICULT CONCRETING MADE EASY BY THE USE OF CALCIUM CHLORIDE



- On almost every type of job, difficult concreting is made easy and many money-saving advantages are gained by the construction official or contractor who uses calcium chloride in concrete. Acceleration of the rate of hardening, increased workability and flowability, savings in time, labor, forms, to name a few.

Take, for example, the reservoir of a municipal water company in an eastern state, pictured here. The spillways and sidewalls were placed in the late fall of 1929, using 2 lbs. of calcium chloride to every sack of cement. By use of calcium chloride, a minimum of formwork was required for the sidewalls, while the rounded spillway crests were placed without any forms whatsoever. Practically as soon as the concrete was placed, it was shaped and finished—an extremely difficult accomplishment without the increased workability and acceleration of set induced by calcium chloride.

In June of this year—9 years after construction—the project engineer describes the job as "one of the finest examples of concrete construction I have ever seen."

You can get the same results in your own concreting—whether it's paving or structural, a large job or a small one. And once you have given calcium chloride a trial, you'll place no concrete without it.

*At top—The spillways and sidewalls of this reservoir were easily placed, through use of calcium chloride in the concrete. Photographed June, 1938—nine years after construction.*

*Bottom—Another view, showing part of the same reservoir. The engineer attributes the excellence of concrete to the use of calcium chloride admixture.*

In addition to the other money-saving advantages obtained, technical authorities such as the National Bureau of Standards and Highway Research Board have established that a calcium chloride admixture produces stronger concrete, in faster time. Write today for complete literature on specifications and methods.

**CALCIUM CHLORIDE ASSOCIATION**
**4145 PENOBSCOT BUILDING DETROIT, MICHIGAN**

**CALCIUM CHLORIDE**
**FOR MODERN CONCRETE CURING**

## Practical facts on every phase of building construction!

HERE is a Library of books that are packed to the covers with the best plans and methods for speeding up production, saving materials and labor, and cutting costs. These six books cover every phase of practical construction work from estimating building costs to the selling of construction service — from plan reading and quantity surveying to practical job management. With the aid of these books the contractor can get business in these dull times by learning how to make savings, and through them being able to make lower bids. The construction superintendent can learn how to keep costs down, which insures his job these days.

### The Dingman Building Contractors' Library

*This library is intended for —*

[1] The building contractor who wants a handy reference set that will give him almost instantly a ready answer to most of the problems that come up in the course of the day's work.

[2] The young men in the building industry who intend to make the business of construction their life work, and who want the kind of guidance that will aid them to climb to the top.

[3] Everyone in the building industry who wants to keep his job by increasing his usefulness and efficiency.

Each one of the volumes in this set is a complete handbook on some important subject. Sturdily bound and pocket size, it will go right "on the job" with you for immediate consultation.

Practical data is given on analyzing a construction job into its component parts — estimating the costs of labor, haulage, equipment, materials, etc. — plan reading and determining quantities from specifications — personnel management — successful supervision of every building operation — efficient and economical business methods — office procedure such as accounting banking, purchasing, etc. — advertising and selling methods for contracting service — and a complete data book of tables, forms and calculations most frequently used by the builder.

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You may send me for 10 days free examination, the six-volume Dingman BUILDING CONTRACTORS' LIBRARY. I agree either to return the books postpaid at the end of 10 days or send a first payment of $1.50 then and $2.00 a month for six months.

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CM-9-38


# NEWS FROM MANUFACTURERS *About Their Products*

***The publications reviewed below, will keep you posted on latest developments in construction equipment and materials available for your use.***

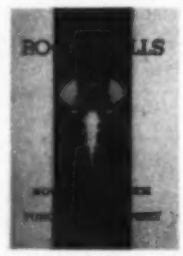
WINDOW CONDITIONING — **Libbey-Owens-Ford Glass Co.**, Toledo, Ohio. (16 pp., illustrated.) Double-glass window insulation for buildings to insure winter comfort and reduce heating costs. For typical suburban residence fuel savings of 23 per cent are claimed as result of window conditioning. Eliminates drafts and prevents window fogging. Illustrations and text explain modern methods of installing double-glass insulation; applicable to double-hung windows or metal sash and casement windows. Figures on fuel savings and suggestions on proper quality of glass to use.

• • •

SCREW DRIVER BITS AND SOCKET WRENCHES — **Independent Pneumatic Tool Co.**, 600 West Jackson Boulevard, Chicago, Ill. (24 pp., illustrated.) Complete specifications on bits for driving slotted head and Phillips recess-head screws and on socket wrench shanks and socket wrenches for all types of bolts and nuts are presented in Catalog No. 70. It describes bits and shanks for use with all models of Thor and other makes of power screw drivers and nut setters. Fully illustrated with application pictures of tools in use on various kinds of jobs and with detail drawings of the bits, shanks and socket wrenches, this manual gives the experienced plant or construction executive all the information he wants in convenient, concise form.

• • •

ROCK DRILL LUBRICATION — **The Texas Co.**, 135 East 42nd St., New York, N. Y. (36 pp., illustrated.) A treatise on how to keep rock drills functioning properly through proper lubrication, with reduction of maintenance costs and increase in drilling footage. Hints on where to look for trouble and what to do about it. Precautions that prevent drilling troubles. Basis of lubrication for drills of various types. Advice on selecting the proper drill for a job. Tabular data on desirable quantities of air cylinder lubricant, air consumption by one drill at different altitudes. Lubricants for rock drill service under moisture conditions, for moisture-free service under normal temperatures and where low temperatures prevail. This booklet, in text and illustration, gives evidence of careful preparation and contains a wealth of practical advice which operators of rock drills can apply with profit.



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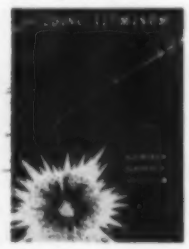
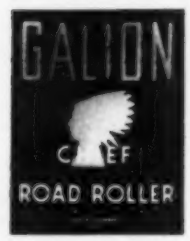
ASBESTOS-CEMENT SEWER PIPE — **Johns-Manville**, 22 East 40th St., New York, N. Y. (16 pp., illustrated.) Information on manufacture and use of Transite asbestos-cement pipe for sewer lines. Suggestions for lowering costs of installation, operation and maintenance with corrosion-resistant pipe, manufactured in diameters from 4 to 36 in., and in lengths of 13 ft. Methods of assembly of sleeve type joints for gravity lines and Simplex couplings for force mains. Notes on house connections. Specifications and tables of crushing strengths, diameters and weights.

• • •

WELDING ALUMINUM — **Aluminum Co. of America**, Pittsburgh, Pa. (48 pp., illustrated). Technique of making permanent joints and repairs on aluminum and aluminum alloy products. Chapters cover fusion welding, welding aluminum vessels, torch welding heat-treated alloys, welding castings, arc welding and resistance welding. Tables cover recommended sizes of welding tips and gas pressures, data for estimating welding costs, electrode sizes, machine settings for spot and seam welding.



ROAD ROLLER — **Galion Iron Works & M'g. Co.**, Galion, Ohio. (8 pp., illustrated.) Road Chief three-wheel road roller is built in 10- and 12-ton sizes powered by 58-hp. gasoline or 62-hp. diesel engines. Steering by hydraulic or manual control. Rear rolls are 69 in. in diameter with widths of 20, 22 or 24 in.; front roll in two sections, is 44 in. in diameter and 44 in. wide. Accessory equipment includes roll-a-plane mounted between steering and compression rolls, hydraulic scarifier, canopy roof steel cab, electric starting and lighting, and sprinkler device. Complete specifications and dimensions.

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POWER SHOVELS — **Bay City Shovels, Inc.**, Bay City, Mich. (14 pp., illustrated). A comparison of those features in power shovel and crane design that mean more yardage at lower operating and maintenance cost. Among design details considered are: chain crowd, machinery assembly, buckets, boom and sticks, crawlers, steering mechanism, swing lock, and boom hoist. Sizes of machines are ⅜ to 1¼ yd.

• • •

PIPE COATINGS — **American Concrete and Steel Pipe Co.**, 5905 Pacific Boulevard, Huntington Park, Calif. (16 pp., illustrated.) Corrosion-proof, sprayable synthetic organic plastic coating — not a paint — for concrete, metal and wood surfaces. Amercoat is name given to surface protection that may be made up of two, three, four or more separate coating solutions, applied, cold, one over the other, to form a corrosion-resistant body which cannot be peeled or chipped off, yet remains plastic enough not to check or crack. Coating is a non-conductor of electric current. While normally colorless, solution may be pigmentized. Ordinarily Amercoat enamel is a three-solution coating made up of prime, enamel and seal coats. Detailed specifications for application are given. Applicable, also as marine bottom paint.

• • •

INDUSTRIAL RAILWAYS CARS — **Koppel Division, Pressed Steel Car Co.**, Grant Building, Pittsburgh, Pa. (16 pp., illustrated.) Summary of representative equipment available in standard designs includes end dump cars, side discharge cars, platform cars, trackless equipment and various other types of cars, ranging in size from end-dump push carts to 50-ton standard-gage railway hopper cars. Car parts include couplers of various types, anti-friction wheel bearings. Also track, switches, turntables and other accessories.

• • •

CEMENT FLOOR COLORING — **Truscon Laboratories**, Detroit, Mich. (4-pp. folder, illustrated). Describes Flor-Dye system for coloring, hardening, dust-proofing and preserving concrete floors. For exterior or interior floors. Coloring material works its way into cement surface and becomes integral part of concrete. Applied in two coats, about 24 hr. apart. Standard colors are: tile red, Spanish green, light brown and dark brown.

• • •

TRACTOR QUESTIONS ANSWERED — **Caterpillar Tractor Co.**, Peoria, Ill. (24 pp., illustrated.) Facts and "reasons why" in answer to queries regarding diesel tractor costs, economy and performance. Topics covered include savings with diesel engines, working life of tractors, upkeep costs, fuel system, protection of working parts from dust and mud, all-weather starting of engine, and dealer service.

• • •

DREDGE PUMPS — **American Manganese Steel Co.**, Chicago Heights, Ill. (16 pp., illustrated). Description of contractor's hydraulic dredge fleet fitted with Amsco equipment of manganese steel, including pumps, pipe-line fittings, and rotary cutter heads.

• • •

MATERIAL HANDLING SYSTEMS — **Gifford-Wood Co.**, Hudson, N. Y. (16 pp., illustrated.) New bulletin No. 138 on material-handling systems, featuring 5-point plan of service to industries. Illustrates pictorially five essential steps in the selection of handling systems: survey, design, proposal, installation and maintenance. Application of conveying machinery to a wide field of industries.

# Everywhere you go IT'S HEIL DIG-N-CARRY SCRAPERS

**Texas** 6 cu. yd. Heil Dig-N-Carry operating at Houston brick plant. Heil indicator gauge insures accurate control of cut.

**Wisconsin** 12 cu. yd. Heil Dig-N-Carry on road job at Glen-Morris. Foolproof hydraulic system insures dependable operation.

**Kansas** 6 cubic yard capacity Heil Dig-N-Carry hydraulic scraper on coal field stripping operation at Scranton, Kansas.

**Maryland** 12 cu. yd. Heil Dig-N-Carry on road job at Glen-Morris. Foolproof hydraulic system insures dependable operation.

**HEIL Dig-N-Carry hydraulic scrapers are proving their efficiency and dependability in daily operation on various kinds of projects—in various types of soils—in various localities! Here are the outstanding Heil Dig-N-Carry features that have universal appeal: (1) Fast, positive loading (2) Hydraulically operated push-out apron positively clears the bowl in record time (3) "Cut and Spread" indicator takes the guess-work out of scraper operation (4) Guaranteed hydraulic system gives split-second control of every movement—Now is the time to investigate all of the advantages of Heil Dig-N-Carry scrapers—Consult your nearest Heil distributor or address your inquiry to the nearest Heil factory.**

## THE HEIL CO.

MILWAUKEE, WISCONSIN • HILLSIDE, NEW JERSEY

# THE SIX BASIC TYPES OF ABW SHOVELS

Plain Back

SOCKET AND BLADE ARE ELECTRIC WELDED. EXCLUSIVE BEND GIVES PERFECT BALANCE. OUTGROWTH OF ORIGINAL AMES SHOVEL.

Socket Shank

MADE FROM ONE PIECE OF STEEL. HAS ROLLED SHOULDER TO GIVE IT ADDED STRENGTH.

Solid Socket

MADE FROM ONE BAR OF STEEL. A STANDARD TYPE FOR RICE AND IRRIGATING SHOVELS.

Solid Shank

THIS IS THE STRONGEST AND TOUGHEST SHOVEL MADE. BLADE AND SOCKET FORGED FROM ONE BAR OF STEEL.

Hollow Back

MADE FROM ONE PIECE OF LIGHT GAUGED STEEL. DESIGNED FOR HANDLING LIGHT AND BULKY MATERIALS. SCOOPS MADE FROM THIS TYPE.

Closed Back

SOCKET AND BLADE ARE MADE FROM ONE PIECE OF STEEL WITH BACK STRAP WELDED TO GIVE A CLOSED BACK.

BUY GOODS MADE IN AMERICA

SINCE 1774

From these six basic types, ABW produces any style shovel, spade, or scoop to meet the customer's requirements. The ABW Line is the most complete line of shovels, spades and scoops manufactured . . . Ask your jobber.

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**AMES BALDWIN WYOMING CO.**

PARKERSBURG, W. V. • NORTH EASTON, MASS.

• ABW PRODUCTS •
SHOVELS · SPADES · SCOOPS
FORKS · · HOES · · RAKES
• POST HOLE DIGGERS •
AGRICULTURAL HANDLES


CHAIN HOISTS AND TROLLEYS — **Ford Chain Block Division, American Chain & Cable Co., Inc.,** Second and Diamond Sts., Philadelphia, Pa. (48 pp., illustrated). Catalog No. 38 covers three major types of drain hoists — spur gear, screw hoist and differential block. Efficiency of Tribloc spur-geared hoist (in sizes from ¼- to 20-ton capacity) has been increased by addition of ball bearings to load sheave. Tables give data on chain pulls for rated loads. Notes on proper care of lubrication of chain hoists. Wide variety of types of anti-friction bearing trolleys for lifting, lowering and carrying service. Details of hangers for I-beam track. Hoist hooks and chain. Chain and cable winches.

• • •

TERMITE PROTECTION — **Copper & Brass Research Association,** 420 Lexington Ave., New York, N. Y. (11 pp., illustrated.) Safeguarding buildings against termite attack by use of shields of sheet copper. Blueprints show basic design of copper termite shields of barrier and deflector types and their application to various construction details. Shields prevent termites from entering building to destroy wood which acts as their food supply or serve to break contact between termites already in building and ground moisture necessary for their existence.

• • •

ROADS, CANALS, EMBANKMENTS — **Caterpillar Tractor Co.,** Peoria, Ill. (182 pp., illustrated; price 50c.) A manual of field practice prepared by F. A. NIKIRK, civil engineer, dealing with methods of construction of roads; canals and embankments using tractors and tractor-hauled equipment. Road construction chapter covers clearing, grading, bulldozer and scraper performance, wagon hauls, operating characteristics of elevating graders and compaction of fills. Figures on production output of machines under various conditions. Additional chapters cover road improvement, paving and road surfacing, road maintenance, building canals and elevating graders, embankment construction and terracing to prevent soil erosion.

The material presented is intended as a guide in selecting the type of equipment best suited for a particular use or that which will best satisfy the requirements of several uses.

• • •

TRUCK CRANES — **Harnischfeger Corp.,** Milwaukee, Wis. (28 pp., illustrated.) Detailed descriptive matter on mechanism of P&H truck-mounted cranes and excavators and numerous photographic illustrations showing wide variety of applications of these machines on steel erection, material handling, clamshell bucket work, power shovel duty and other services. Condensed specifications and clearance diagrams. Features of truck-crane are low center of gravity, planetary boom hoist, low head room, stability, fine operating control and utmost mobility. Approximate working weights for truck mounting (not including weight of truck) are: 25,700 lb. for crane and 27,400 lb. for shovel. Boom lengths of from 25 to 50 ft. for crane models. Excavator model rated at ½ cu.yd.

• • •

MECHANICAL RUBBER GOODS — **Goodyear Tire & Rubber Co., Inc.,** Akron, Ohio. (56 pp., illustrated.) Deals with variety of mechanical rubber products, including industrial transmission, conveyor and elevator belting; air, water, welding, steam and suction hose; railroad goods; molded and lathe cut goods such as pump diaphragm, stuffing box rings, chute lining, etc. In addition to information on the construction and application of mechanical rubber goods, the catalog contains useful hints on proper care of rubber belting and maintenance of belting service records.

• • •

HEAVY COATED WELDING RODS — **Metal & Thermit Corp.,** 120 Broadway, New York, N. Y. (31 pp., pocket-size, illustrated). Revised and enlarged booklet contains brief data on physical properties and chemical analysis of the weld metal deposited by each of the twenty odd electrodes in the Murex line of welding rods. Included are individual, specially designed electrodes for high speed, downhand welding of mild steel; for all-position welding; for horizontal fillet work; for welding manganese, carbon-molybdenum and nickel steels; for several types of stainless steels; and for a number of the new high-strength, low-alloy steels.

# Compare THIS PROFIT WITH YOUR PRESENT EARNINGS

MORE than 150 Byers Bear Cat Jr. shovel owners have told us what their shovels *cost* them to operate. Many also have told us what their shovels *earn* for them.

They report daily operating costs (for every expense including depreciation, repairs, maintenance, etc.) averaging $9.74 plus operator's wages for 8 hours' work.

They report income of $50 to $75 and sometimes $100 per day. Some Bear Cat Jr. contractors turn down small half-day jobs that would pay $30 to $40 because they have plenty of better paying one and two day jobs. One owner recently moved his machine onto 150 jobs in 14 months. Another one bought his Bear Cat Jr. on the longest possible terms, but proudly paid for it "in full" four months later from its earnings.

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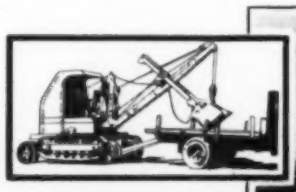
2. Their daily costs are low.
3. Their daily earnings are high . . . often as much as half yard shovels earn.
4. The Bear Cat Jr. is fast, handy, versatile . . . does many kinds of work. Therefore, it's always easy to keep it busy.
5. The Bear Cat Jr. is readily towed on its own patented two axle trailer behind a light truck. It costs less to move farther and faster.



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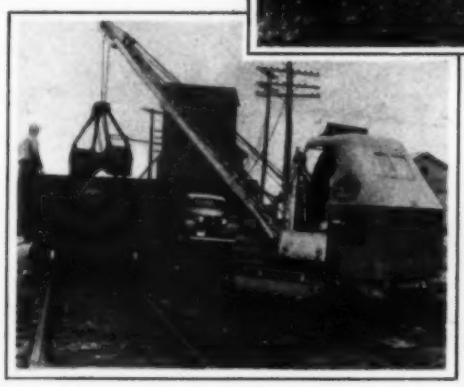

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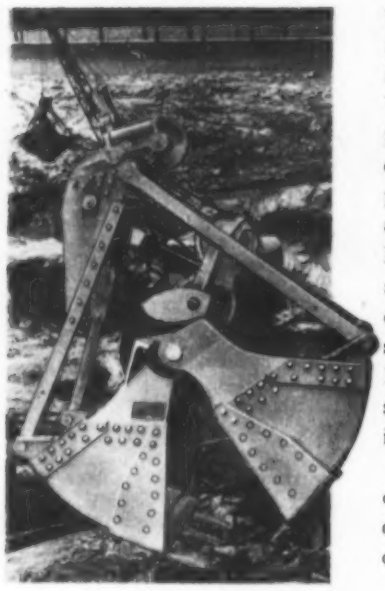

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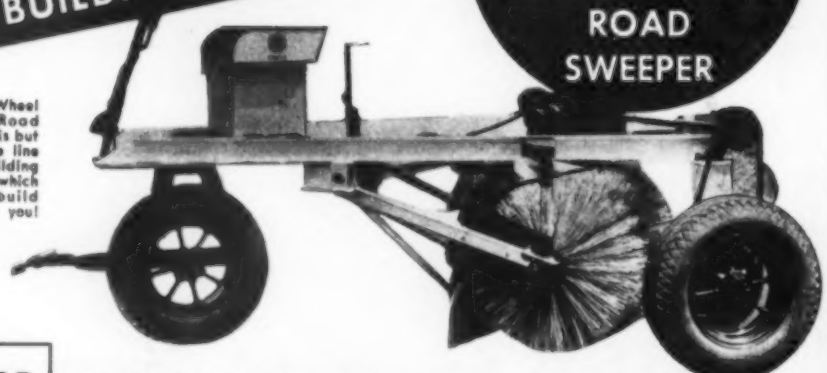

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THERMIT WELDING — **Metal & Thermit Corp.,** 120 Broadway, New York, N. Y. (34 pp., illustrated). More complete than anything published previously on the subject, the new booklet gives the history of Thermit welding; describes the nature of the Thermit reaction, by means of which superheated liquid steel is produced for welding purposes; discusses the physical properties of Thermit weld metal; outlines the methods employed in welding. In addition, the advantages and economies of the process, for emergency repairs in the marine field; for repairs throughout industry to machine frames, crankshafts and other heavy parts; for reclamation work in steel mills; and for rail welding on steam railroad, street railway and coal mine track, are thoroughly covered. Also, several pages are devoted to Thermit for foundry use, and to the pure, carbide-free metals and alloys produced by the Thermit reaction and used for alloying purposes in the manufacture of steel and non-ferrous alloys.

• • •

HEAVY DUTY TRAILERS — **C. R. Jahn Co.,** 228 N. La Salle St., Chicago, Ill. (6 pp. illustrated). Displays with short description of units complete line of trailers, including four-wheel single purpose unit; capacities up to 24,000 lb.; dual oscillating-type rear axle, capacities 25,000 to 40,000 lb. tandem rear axles, rocker beam type, capacities 20,000 to 40,000 lb.; low flat frame with removable front axle for convenient loading, 5 to 15 tons; six wheels, dual rear axles, oscillating type, 15 to 30 tons; six wheels, tandem rear axles mounted on rocker beams, 15 to 30 tons; 10-wheel 30 to 40 tons; 12-wheel, 40 to 60 tons; semi-trailer, tandem rear axles, 12 to 20 tons; light weight type front deck, 5 to 18 tons. All drop frame models furnished in full and semi-trailer types.

• • •

LOW COST ROADS — **Allis-Chalmers Mfg. Co.,** (Tractor Division) Milwaukee, Wis. (34 pp., illustrated.) Types of low-cost roads, materials used in their construction, and their approximate costs. Statistics on farm-to-market roads and statistics of rural highway mileage. Notes on stabilized soil roads. Selection and use of proper equipment for construction and maintenance, with particular reference to blade graders, tractors, scrapers and bulldozers.

• • •

FULL REVOLVING DERRICK — **Clyde Iron Works, Inc.,** Duluth, Minn. (24 pp., illustrated). Describes the Clyde "Whirley," a traveling, full-revolving long reach, heavy-duty steel derrick. Lifting capacities up to 50 tons at 50-ft. radius or 11 tons at 150-ft. radius. Types of mounting include rollers, trucks and gantries. Photographs illustrate applications of machine (with boom lengths from 50 to 150 ft.) on lock and dam construction, sand and gravel plants, harbor work, material handling, bridges, coal yards, etc. Adaptable for clamshell, dragline or hook work. Full design and construction details covering lower frame, center pin assembly, rotating frame, equalized wheel carriage, machinery deck, A-frames, boom and mounting. Powered by gasoline, diesel, steam engines or electric motors.

• • •

MACHINERY VIBRATION CONTROL — **Korfund Co., Inc.,** Long Island City, N. Y. (16 pp., illustrated.) Reprint of a paper on the design of machine foundations cushioned to neutralize the dynamic forces acting upon them, presented before the American Society of Mechanical Engineers by S. Rosenweig. In addition to explaining the most dependable types and applications of anti-vibration products, the paper describes the most recent developments in this field. Steel spring mountings of various types are used to dampen machine vibrations.

• • •

ROCK CRUSHERS — **Universal Crusher Co.,** Cedar Rapids, Ia. (4 one-page bulletins, illustrated.) Equipment covered includes portable single crusher quarry plant with elevator, screen and bins; dual crusher quarry plants and accessories; and single crusher gravel plants of two types.

• • •

GOGGLES FOR EYE PROTECTION — **American Optical Co.,** Southbridge, Mass. (4-p. folder, illustrated.) Instructions on proper fitting of eye-cup goggles and spectacle type goggles for comfort and safety of industrial workers. Adjustments for nose bridges, headbands, nose pads, temple pieces and side shields.

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**These two large views of Galion graders tell their own story . . . they clearly show that the blades must take plenty of tough action in ditching and blading work on new road construction work.**

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*The big Galion master model motor grader with diesel power is shown above. Next below is the Galion tandem roller, a compact, efficient unit. The Galion No. 120 leaning wheel grader is illustrated at the bottom. This unit is also hydraulically controlled.*

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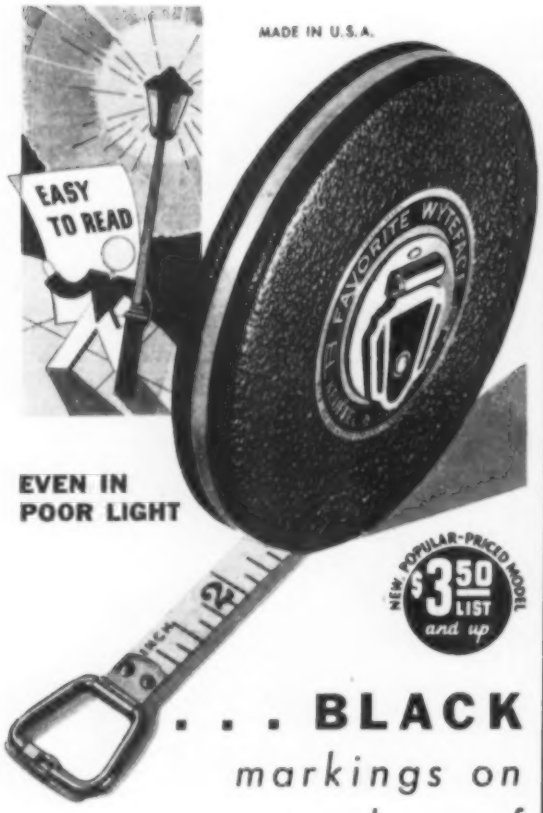


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ROADS, CANALS, EMBANKMENTS—**Caterpillar Tractor Co.**, Peoria, Ill. (182 pp., illustrated.) A detailed study by F. A. Nikirk, civil engineer, of tractor-operated equipment uses, adaptability of equipment to field requirements and production that may be expected from various units employed for constructing roads, canals and embankments. Contents covers road construction, road improvement, paving and road surfacing, highway maintenance, building canals with blade and elevating graders, canal maintenance, embankments, and terracing to prevent soil erosion.

• • •

PORTABLE ELECTRIC TOOLS—**Black & Decker Manufacturing Co.**, Towson, Md. (54 pp., illustrated.) Company's complete line of portable electric tools, including "Shorty" ball-bearing drills, utility power drills, right-angle adjustable screw-driver and wrench, adjustable nut-runner, tapper, valve refacer, grinders, sanders and electric saws. Specifications and prices. Drills range in size from 3/16 to 1 in. Hole saw attachment cuts holes up to 4-in. diameter in steel, sheet metal or wood. Screw drivers have adjustable clutch arrangement to pre-determine amount of torsion applied.

• • •

INDUSTRIAL SAFETY EQUIPMENT—**Mine Safety Appliances Co.**, Pittsburgh, Pa. (128 pp., illustrated.) Second edition of catalog No. 5-B covers gas masks, oxygen-breathing apparatus, Comfo dust respirators, carbon monoxide detectors. For construction and mining workers there are several models of Skullgards, or "hard-boiled" hats, molded in one piece from tough micarta and fitted with soft, cushioned sweatbands. The company makes a line of goggles for various purposes, including welding and chipping; also safety shoes and gloves. Safety belts prevent falls from high places. First-aid kits come in a variety of sizes and types of contents, including bandages, compresses, antiseptics, splints.

• • •

ROAD ROLLER—**Galion Iron Works & Mfg. Co.**, Galion, Ohio. (8 pp. illustrated.) Road Chief three-wheel road roller is built in 10- and 12-ton sizes, powered by 58-hp. gasoline or 62-hp. diesel engine. Steering by hydraulic or manual control. Rear rolls are 69 in. in diameter with widths of 20, 22 or 24 in.; front roll in two sections, is 44 in. in diameter and 44 in. wide. Accessory equipment includes roll-a-plane mounted between steering and compression rolls, hydraulic scarifier, canopy roof steel cab, electric starting and lighting, and sprinkler device. Complete specifications and dimensions.

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MATERIAL HANDLING SYSTEMS — **Gifford-Wood Co.**, Hudson, N. Y. (16 pp., illustrated.) New bulletin No. 138 on material handling systems, featuring 5-point plan of service to industries. Illustrates pictorially five essential steps in the selection of handling systems: Survey, design, proposal, installation and maintenance. Application of conveying machinery to a wide field of industries.

• • •

PORTABLE ELECTRIC TOOLS—**Skilsaw, Inc.**, 3310 Elston Ave., Chicago, Ill. (54 pp., illustrated). Line includes hand saws, drills, belt sanders, disk sanders, grinders, blowers and floor sanders. Photographs illustrate typical applications; for the hand saw these include cutting and notching rafters, trimming rough flooring, making concrete forms, trimming doors and sash, cutting light-gage steel, etc. Mechanical features of hand saw include universal type a.c.-d.c. electric motor, self-adjusting brushes, balanced cooling fan, aluminum alloy body, worm-gear speed reduction unit, crucible steel saw blades, rust proofing of exposed parts. Light-duty and heavy-duty models. Saw blades from 6 to 12 in. in diameter, making cuts from 1⅞ to 4⅝ in. deep. Also groover saw. Electric drills are ball-bearing units with capacities, in steel, from 3/16- to ⅞-in.-diameter holes. Sanders with vacuum dust collectors.

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CONCRETE VIBRATORS—**Electric Tamper & Equipment Co.**, Ludington, Mich. (78 pp., illustrated.) A loose-leaf (6½x4¼-in.) booklet designed to serve as a guide in selecting the right size and type of Jackson vibrator for various kinds of service, such as: mass concrete, general construction, light construction, form vibrating, floors and streets, concrete pipe. Vibration is done by two types of machine, the internal or vibro-spade, and the external, or platform types. Booklet includes data on concrete surface grinder, electric power unit, backfill tamper and sump pump.


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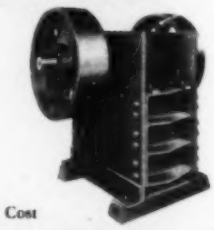

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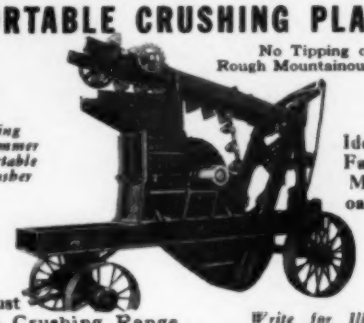

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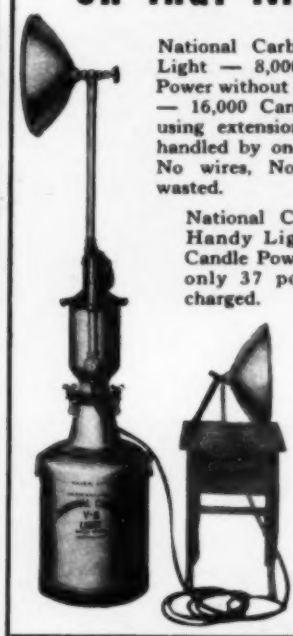

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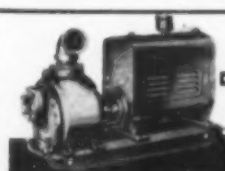

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